RAILROAD MAN'S MAGAZINE

"U. S. GOVERNMENT – EXPEDITE!"

How Patriotism Is Increasing Train-Loads *and* Efficiency Is Speeding Them Up

WATER-POWER TAMED FOR RAILROADS!

A Plea to Let "White Coal" Save the Black in War-Time Train Operation

Pictures
Articles
and Fiction
Dealing with
Rail *and* Wire

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Little-Known Genius Whose Inventions Have Made the Mile-Long Drag Possible *by* C. F. CARTER

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NOVEMBER

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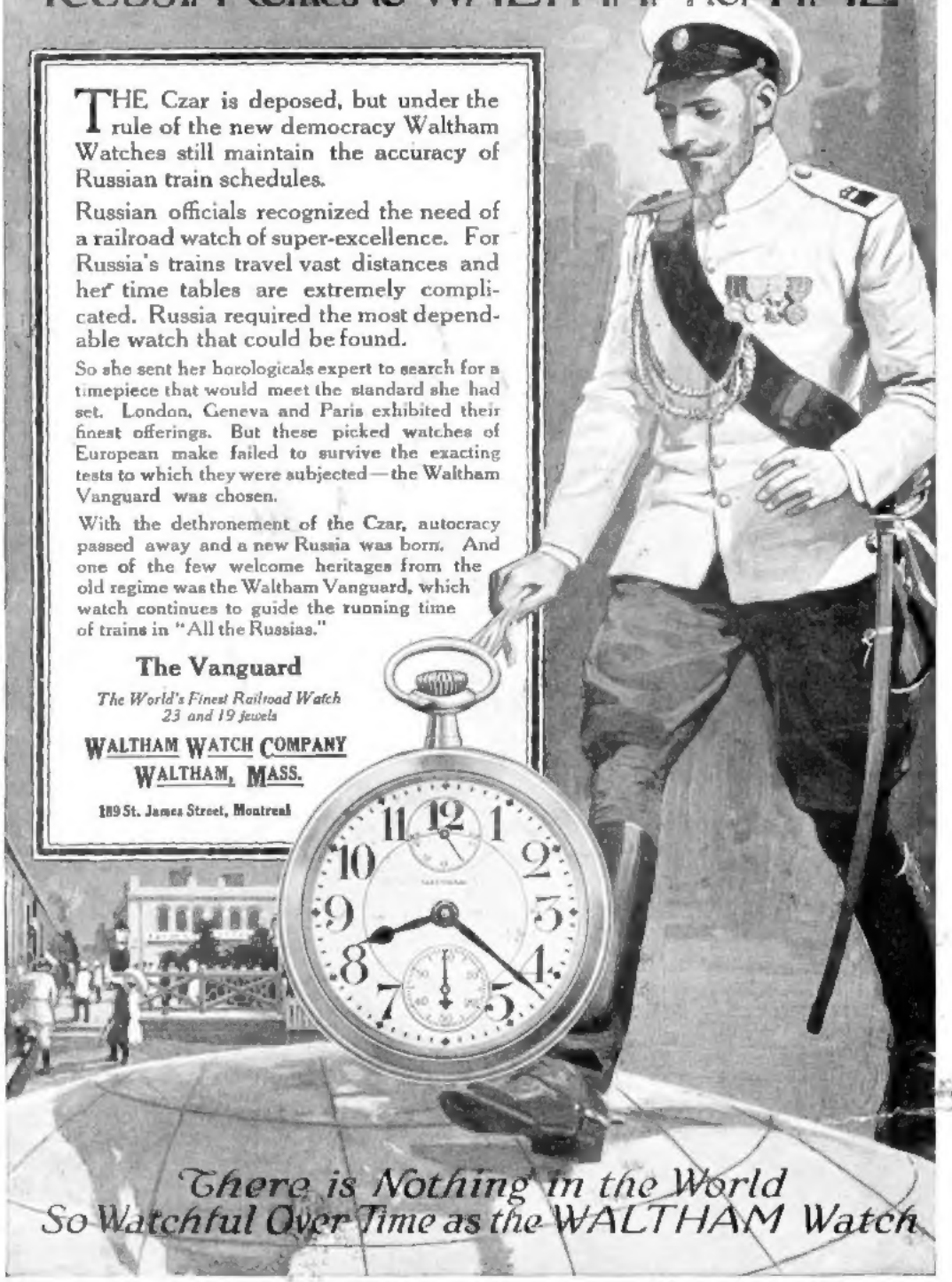

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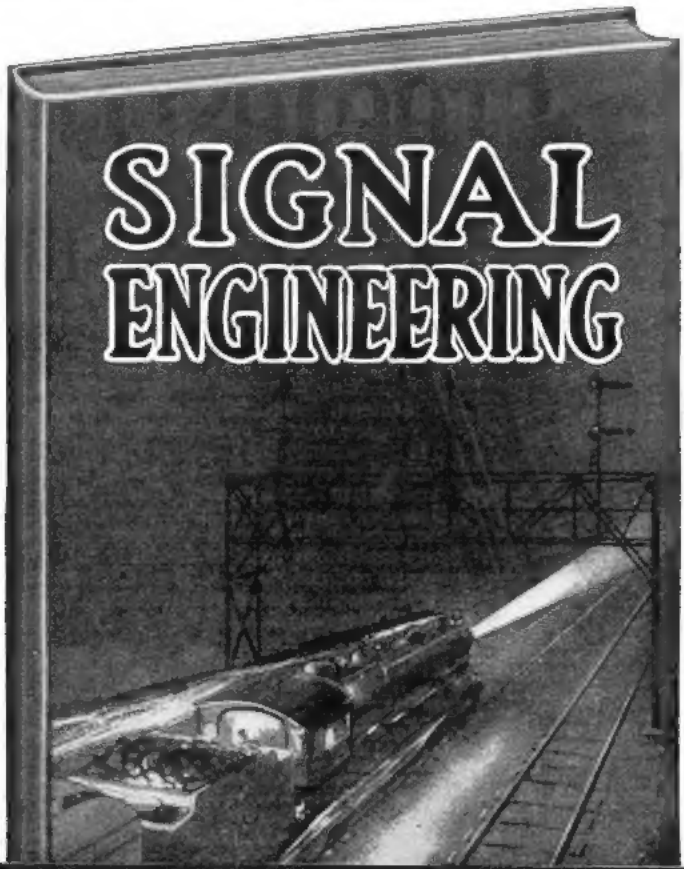

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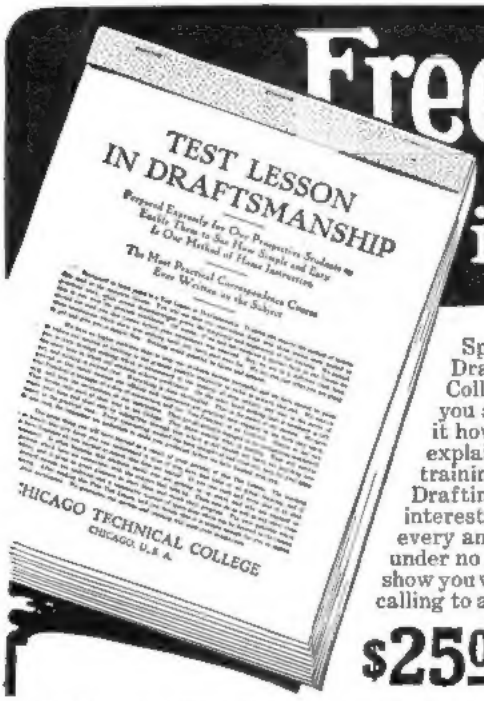

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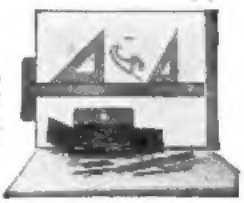

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RAILROAD MAN'S MAGAZINE

CONTENTS FOR NOVEMBER, 1917

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FEATURES

U. S. GOVERNMENT—EXPEDITE! (Illustrated) . . . . . Marlen Pew 353
SAM LOYD'S RIDDLES FOR RAILROADERS. (Illustrated) . . Sam Loyd 378
BIG RAILROADING—2. Second Series. (Illustrated) . . . . . Charles Frederick Carter . 385
THESE MEN HAVE BEST OPR'S FIST. (Illustrated) 401
TURNER, AIR-BRAKE WIZARD. (Illustrated) . . . . . Charles Frederick Carter . 413
TAME WATER-POWER FOR RAILROADS! (Illustrated) . . Samuel H. Paine . . . 424
MENTAL SEMAPHORE MAKES OR MARS . . . . . Frank Kavanaugh . . . 437
DOW'S NEWEST SAFETY FILM STORY. (Illustrated) . . . J. W. Greenberg . . . 454
MAKING DAYLIGHT ON THE TRAIN. (Illustrated) . . . . Theodore Benton . . . 475
THE LANGUAGE OF THE TRAIN-WIRE . . . . . LeRoy Palmer 484
WHAT I, THE HEADLIGHT, SEE . . . . . William Francis . . . 502
PRANKS OF WELL-KNOWN OPERATORS . . . . . Jesse K. Brown . . . 506
STANDARDIZING RAILROAD PRACTISE . . . . . Thaddeus S. Dayton . . 510

FICTION

AN ORPHEUS OF THE SINGING RAIL . . . . . Frank Blighton 368
LUCK AND LOVE ON THE NARROW GAGE . . . . . Charles Wesley Sanders . 405
"PLENTY OF SEATS UP FORWARD" . . . . . Charles L. Funnell . . 435
TRIPPING DOWN THE OLD MISSISSIP'. A Six-Part Story—
Part Three . . . . . Raymond S. Spears . . 442
"HELP ON THE HILL" . . . . . Buckley Olcott 470
YOUNG ORDEN PUTS 'EM IN TO CLEAR. A Five-Part
Story—Part Three . . . . . William Wallace Cook . 517

DEPARTMENTS

THE SUNNY SIDE OF THE TRACK 382
FROGS 412
WITH THE THROTTLE WIDE OPEN . . . 453
BY THE LIGHT OF THE LANTERN. (Illustrated) 458
TELEGRAPHIC AND TELEPHONIC. (Illustrated) 465
WITH THE INVENTORS. (Illustrated) 487
HELP FOR MEN WHO HELP THEMSELVES.
No. 86. Thermit Welding: Its Uses, Especially in
Railroad Practise. (Illustrated) . . . . S. Mann 491
ON THE EDITORIAL CARPET 523

MISCELLANY

AN ENGINE HAS ITS UPS AND DOWNS. (Ill.) 367
EVERYBODY WORKS—AND FATHER! (Ill.) 376
SEEN THROUGH THE CAR-WINDOW. (Ill.) . 377
TRAIN WHISTLES. (Poem) . . . T. J. Murray 380
HOW THE RAILROADS FARE IN BATTLE.
(Illustrations) 381
THE PICNIC-TRAIN. (Poem)
Lydia M. Dunham O'Neil 384
A RECORD-BREAKER IN TRAIN-ORDERS.
(Illustrated) 399
LET'S FOLLOW THE FLAG TO FRANCE!
(Poem) . . . . . J. Eugene Chrisman 400
GERMAN EFFICIENCY ON WAR ROADS.
(Illustrations) 434
WRAPPING THE SHELL-CAR IN ROPE. (Ill.) 436
TOMMIES TOTE THEIR OWN RAILWAYS. (Ill.) 440
A TICKET-CASE THAT DWARFS 'EM ALL.
(Illustrated) 441
RAILROADS—LAID WHILE YOU WAIT. (Ill.) 468
NEW DEVICES FOR RAILROAD SAFETY.
(Illustrated) 469
THE BRASS-POUNDER. (Poem) . . R. O'Head 474
THE COMMUTER AND HIS TICKET. (Poem)
Henry I. Myers 486
WHEN THE MOGULS GO TO SLEEP. (Poem)
Remsen Crawford 501
FLIP THIS FLIMSY OVER, YE OPRS! (Illustrated) 503
FAIR RAILROADERS, WHOSE JOB IS TO
MAKE TRAVELING EASY FOR YOU. (Ill.) 504
OLD AND NEW ON THE RIO GRANDE. (Ill.) 509
UNCLE SAM'S BRIDGES ARE SAFE. (Illustrated) 516
THE OLD FLAGMAN ON ELECTRICITY.
(Poem) . . . . . Olin Lyman 522
THE RAILROAD MAN'S MAIL-BAG 524
LAY OF THE ANCIENT LOCOMOTIVE.
(Poem) . . . . . R. B. Manbert 528

THE FRANK A. MUNSEY COMPANY, 8 West Fortieth Street, New York, and Temple House, Temple Avenue, E. C., London
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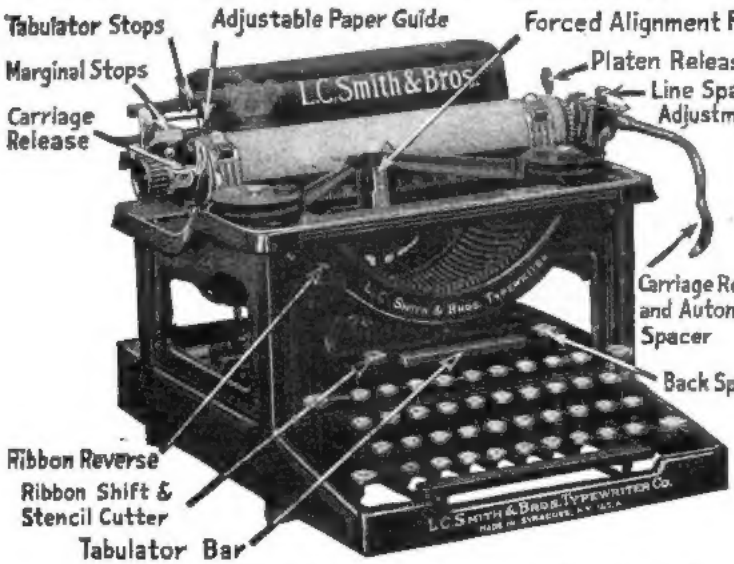

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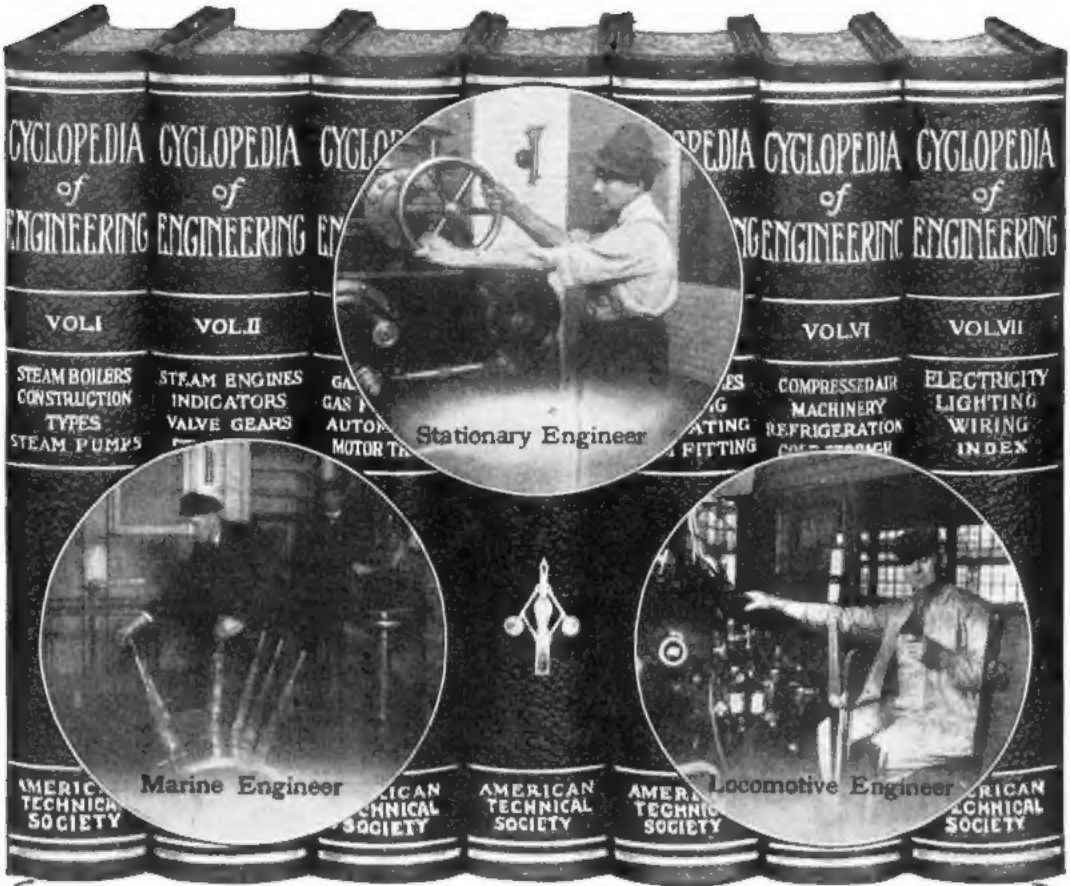

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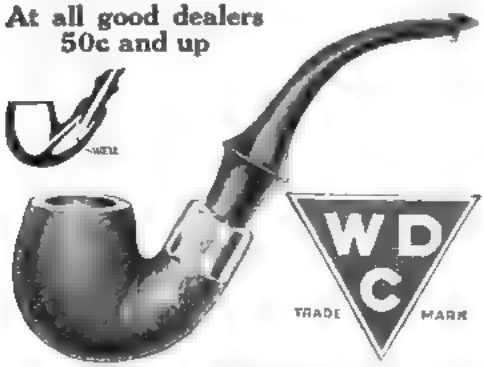

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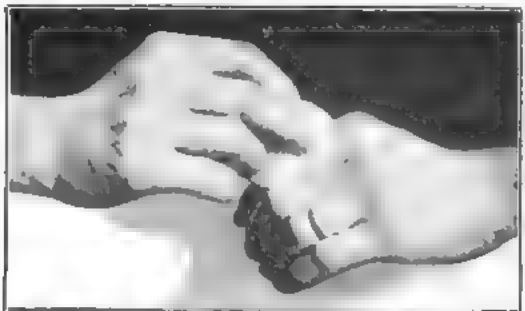

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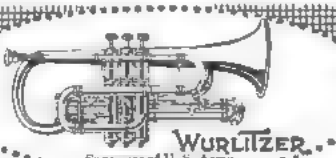

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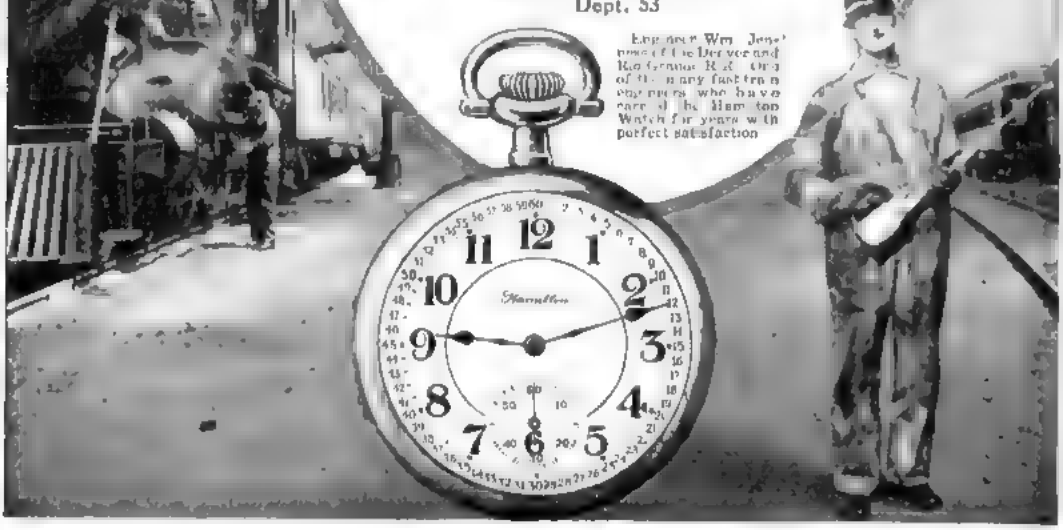

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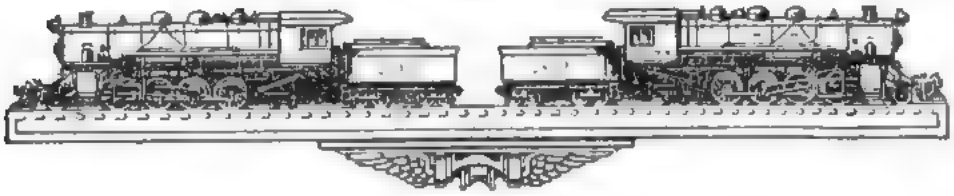


U. S. GOVERNMENT—EXPEDITE!

Increased Efficiency Has Added 150,000 Cars to Freight-Moving Capacity of Country, and Saved 25,000,000 Passenger Miles—Huge Coal Economies.

BY MARLEN PEW.

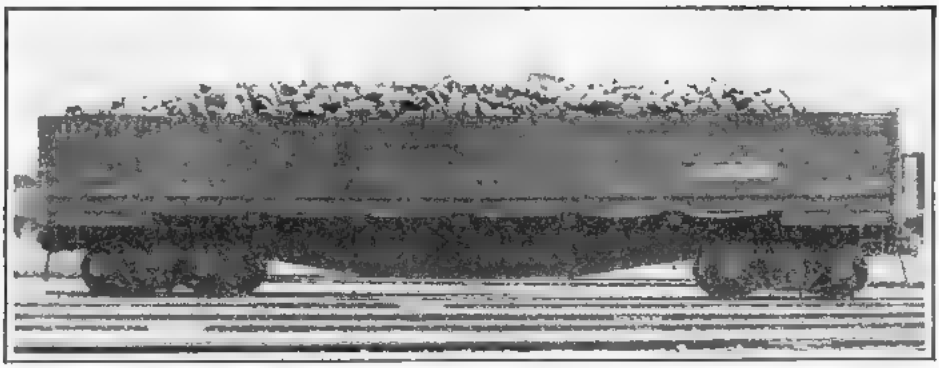
THE ISSUE THAT RAILROAD MEN HAVE MET IN TERMS OF ACTION.

"To the men who run the railways of the country, whether they be managers or operative employees, let me say that the railways are the arteries of the nation's life, and that upon them rests the immense responsibility of seeing to it that those arteries suffer no obstruction of any kind, no inefficiency or slackened power."—*From President Wilson's Proclamation, April* 16, 1917.

HERE'S an answer to your question, Uncle Sam, as to what the railroad men of this country could do for you in your time of superlative need! The boys in jeans and with pencils behind their ears have speeded up their gigantic machine, covering over 265,000 miles of railroad in your mighty domain, as that machine has never before been speeded.

These boys behind the boys behind the guns have had their coats off, to be sure, good old uncle, and here in a nutshell is what they have accomplished to make good the proud boast of this republic.

You remember last May how we all felt we had reached the limit of our railroad capacity to move the mountains of freight and passenger traffic that heaped up on every railroad right-of-way from the Atlantic to the Pacific? Well, sir, we were just fooling ourselves. When you said "War," and your Big Chief in the White



BY LOADING CARS TEN PER CENT OVER THEIR MARKED CAPACITY, THE RAILROADS HAVE SUCCEEDED IN MOVING ABOUT TWENTY PER CENT MORE COMMERCIAL FREIGHT, WITH THE SAME NUMBER OF CARS, THAN THEY DID LAST YEAR

Photo by courtesy of the Railway Age Gazette.

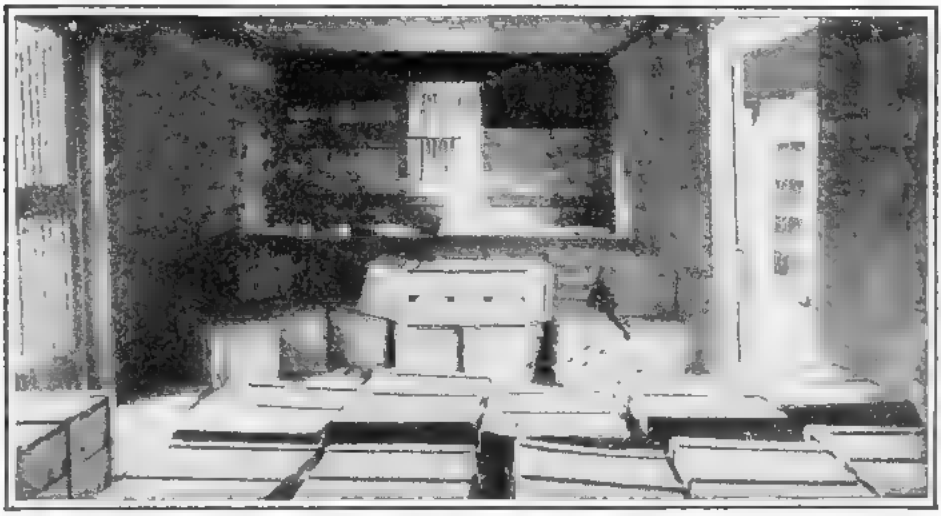
House told us that upon railroad men "rests the immense responsibility of seeing to it" that the railroads make good on the biggest contract they had ever undertaken, we looked around and discovered some Yankee means of committing impossibilities—and, sir, the car shortage of last May has been reduced in three months from 148,627 to 33,776, or one-fourth.

Is that getting down to a war basis, sir?

Mighty Freight Increase.

Railroad men have not only accomplished all the stupendous tasks that the government has set for them in the whirlwind campaign of preparedness for the life-and-death struggle overseas, but they have succeeded in moving from fifteen to twenty per cent more commercial freight, with the same number of cars, than in the previous year.

Recognizing the fact that the problem of the nation was as much to assure the comfort and security of the people at home as to further the plans of the army going abroad, freight of every description which would minister to human wants has been looked upon by the patriotic host of railroad workers as war material, and they have put ball-bearing skates on it.



PARTIALLY LOADED CARS, A COMMON SIGHT A YEAR AGO, ARE NOW A THING OF THE PAST. THE RAILROADS ARE HELPING UNCLE SAM BY UTILIZING EVERY BIT OF ROLLING STOCK TO ITS MAXIMUM CAPACITY

Photo by courtesy of the Railway Age Gazette.

July was a whopper month. The sun shone fiercely, the perspiration flowed in rivers; but railroad men were pulsing with love of country and a purpose transcending the borders of the mere workaday life, and they heaved to with results which Fairfax Harrison, chairman of the Railroads' War Board, has characterized as " the finest job of their lives."

When it came to business for the government the boys opened the speed-gage wide. The movement of cantonment material alone occupied the service of more than 100,000 cars.

You have read in your newspapers that these great army camps " developed like magic." That is not the word; they sprang up like mushrooms by token of the steady arms of railroad men, of whizzing locomotives, of hard-pressed cars which were so manipulated as to give service better than four-to-one of normal commercial times. That's the secret behind that word magic.

And what is said of the cantonment feat may be said with equal truth of the service rendered to transport the extraordinarily heavy traffic of food supplies, war material of all sorts, and particularly the products of the munitions factories.

Swift Right of Way.

Railroad men knew that our international brothers were holding back the foe, pending the arrival of the Sammies. The giant crates billed to Atlantic ports held the stuff that should mark the deadline between democracy and savage Kaiser greed—and they got swift right of way by token of the patriotism of every man on the line, from the presidents gathered at Washington and directing the war service of American railroads down to the grizzled old veteran with the flag at the dusty crossroads.

Every railroad man who has had a " bit " in this inspiring transaction should have the details of how it has all been accomplished. In disorganization, on ordinary competitive principles, the result could not possibly have been obtained. But a giant merger of all the railroads, coordinating on definite lines to a specified end, achieved results which heretofore would have seemed impossible.

It was early in April that Secretary of the Interior Franklin Knight Lane introduced and had passed in the Council of National Defense a resolution that Commissioner Daniel Willard be requested to call upon the railroads so to organize their business as to lead to the greatest expedition in the movement of freight.

Within five days the chief railroad executives of the country met at Washington, and discussed the situation which at that time appeared highly complex, due to the fact that the railroads were straining to what seemed to be capacity limits to keep abreast of the necessities of ordinary peacetime traffic.

A Continental Merger.

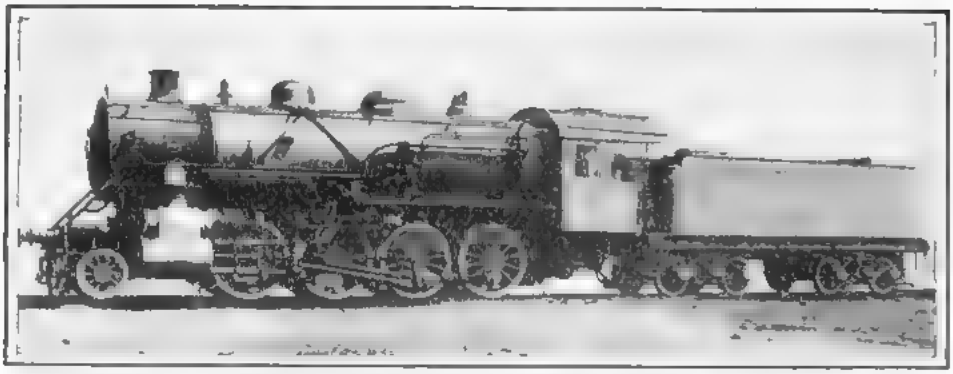
The railroad executives reached the conclusion that, if they might actually merge, during the period of the war, all of the railroads in a mighty continental system, responsive to the coordinative operation plans of a central committee located at Washington, and for the time being simply forgetting individual and competitive activities in one great heave for national transportation efficiency, the results desired might be obtained.

And that is what the railroads have done. Practically all are in this gigantic " trust " of patriotism.

To carry out the work a committee of twenty-seven was appointed, and of that number an executive committee of five was selected to direct the business. This Railroad War Board consists of Fairfax Harrison, president of the Southern Railway, chairman; Hale Holden, president of the Chicago, Burlington and Quincy; Julius Kruttschnitt, chairman of the executive committee of the Southern Pacific; Samuel Rea, vice-president of the Pennsylvania; and Howard Elliott, formerly president of the New York, New Haven and Hartford.

Subordinate committees were then appointed, covering sectional requirements and also giving a piece of the operating machinery into the hands of each departmental commander of the army.

There were numerous subcommittees designed to meet special needs, such as

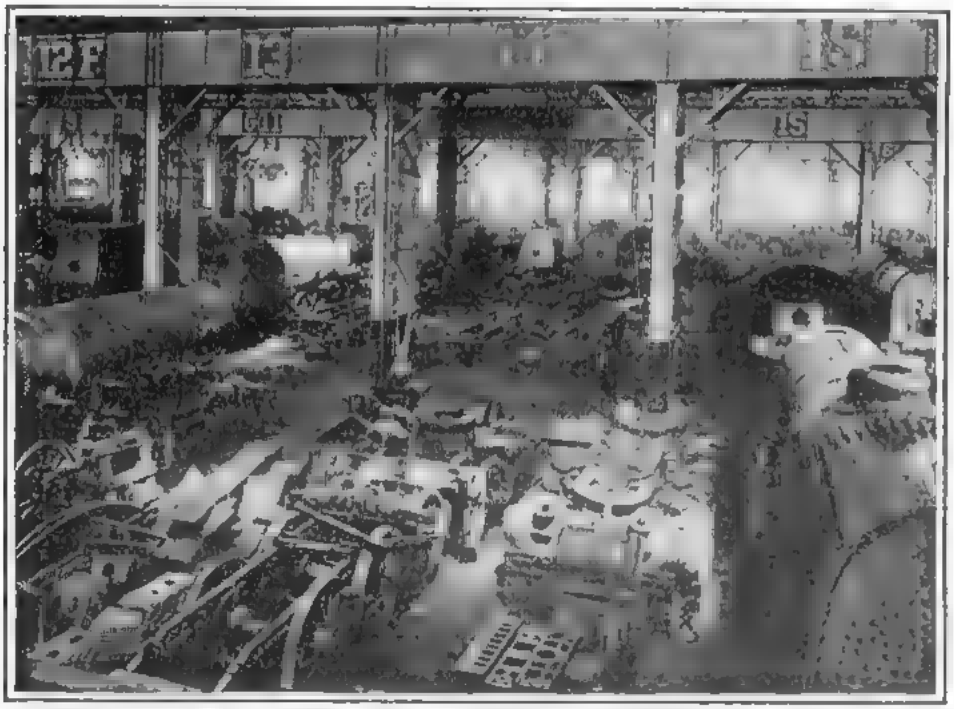


MANUFACTURERS OF RAILROAD PRODUCTS AS WELL AS THE RAILROADS THEMSELVES, PROMISED COÖPERATION. THE FIRST WAR LOCOMOTIVE FOR OUR GOVERNMENT WAS COMPLETED BY THE BALDWIN WORKS IN 20 DAYS. IT IS A CONSOLIDATION, BEARS THE NUMBER 1, AND WAS BUILT FOR SERVICE IN FRANCE.

experts to oversee car service, military transportation accounting, military passenger tariffs, and military freight tariffs. The vice-presidents of the various express services were selected to act as a committee to deal with the subject of their special knowledge. Altogether some 110 men are so engaged.

The cost of this operation for the government, not counting the salaries of the railroad officers, who are devoting a very large amount of their time to the national work, is borne *pro rata* by the railroads, and it will amount to about half a million dollars per year.

The first important step of the War Board had to do with the movement of coal and iron ore. The reserve stocks of coal



ERECTING SHOP OF THE BALDWIN WORKS AT EDDYSTONE (PENNSYLVANIA) WHERE MORE THAN 900 LOCOMOTIVES ARE UNDER CONSTRUCTION FOR THE UNITED STATES ARMY. THE WORK IS BEING RUSHED WITH ALL POSSIBLE SPEED. IT IS EXPECTED SOON TO TURN OUT FOUR ENGINES A DAY HERE.

in many parts of the country were found to be seriously depleted, due to abnormal consumption, and it was considered of paramount importance to give a substantial movement to this fuel during the summer months, that no disaster might be possible during the winter, and that manufacturing might not pause anywhere.

The government was making heavy demands upon the manufacturers of iron commodities, while the pressure from the Allies for munitions was intense, and the second great need was to deliver at the furnaces an ample supply of ore, with a safe surplus.

Orders were issued to the railroads which made it compulsory to send gondola and hopper cars, when empty, to or in the direction of the home road, either empty or loaded. Every movement of the car, the order stated, must be in the interest of prompt return to the home road; if necessary, short routing of empty cars without charge was demanded to accomplish the general purpose.

Personal Responsibility.

To avoid abuse or evasion of the order, the War Board placed the responsibility of scrupulously seeing it through directly upon the shoulders of the president of each road, making it an especial charge upon his good faith that no employee should fail literally to meet the rule.

Each road was also ordered to give preference over all other traffic in the daily distribution and movement of cars to gondolas and hoppers.

Thus, in recent months, you have witnessed the spectacle of local passenger traffic laid out for heavy trains of coal and ore cars. Many a crack passenger-train has puffed and snorted and whined on a siding, with nervous American travelers getting a taste of what war means, while ponderous freights have steamed to the goal set by the War Board at Washington.

The records of the subcommittee in charge of the coal and ore movement show that the performance has been all that the most exacting military experts might have wished.

The War Board early in their work brought about a pooling arrangement both at tidewater ports and the lake ports that has resulted in the quicker movement of cars and in a great saving of available car capacity.

At the lake ports an arrangement was made between the lake carriers and railroad ore carriers so that when coal arrived at lower lake ports there would be a minimum delay in putting it into boats, thus releasing cars and sending the boats forward promptly. Previously boats were loaded only with coal that was consigned to them. Under the pooling arrangement they were loaded with any coal at hand.

Saving Cars.

Furthermore, an agreement was reached whereby all shippers of tidewater coal now pool their coal at the ports of New York, Philadelphia, Baltimore, and Hampton Roads. The railroads, through this arrangement, will be able to handle to these ports 6,640,000 tons more this year than last, or a total of approximately 37,000,000 tons.

Heretofore 1,156 different kinds of coal have been shipped to Atlantic ports, but under the pooling arrangement the number was cut to 41 different kinds, thus saving the use of 133,000 freight-cars.

Here, indeed, is a concrete example of the extravagance of the competitive system. The American people are the most discriminating buyers in the world, and unmurmuringly pay for their predilections; but in war-times individual fancies may easily be merged into common necessities, sometimes without the slightest ill effect.

When coal of a certain grade is now wanted for highly specialized purposes, for instance by a steamer, the coal of that kind of any or all shippers is appropriated to fill the order.

The railroads, in meeting the great emergency, not only have speeded up their existing equipment, but have gone heavily into new purchases of rolling-stock. In nine months they have installed 989 new locomotives and 44,063 new cars.

They are ordering more than 2,000 new locomotives and more than 100,000 new freight-cars. The builders are working

night and day to meet these demands, and most of the orders may be filled by the first of January, if the Allies don't get them.

Pile on Freight!

The spirit of the national campaign has spread to individuals in the transportation field, in every direction, and the cry of the railroad man everywhere is:

"Make one car do the work of two!"

Shippers are urged to load cars ten per cent in excess of marked capacity.

Cars needing repairs are not held at the shops an instant longer than is necessary.

Every device that is practical is being used to improve methods of firing locomotives.

Light locomotives, which might have been on the scrap-heap by this time, are being held in the service for the best that can be got out of them.

Shippers are told to load and unload without delay, and, while this is an old cry, the railroads are really getting some support from shippers now.

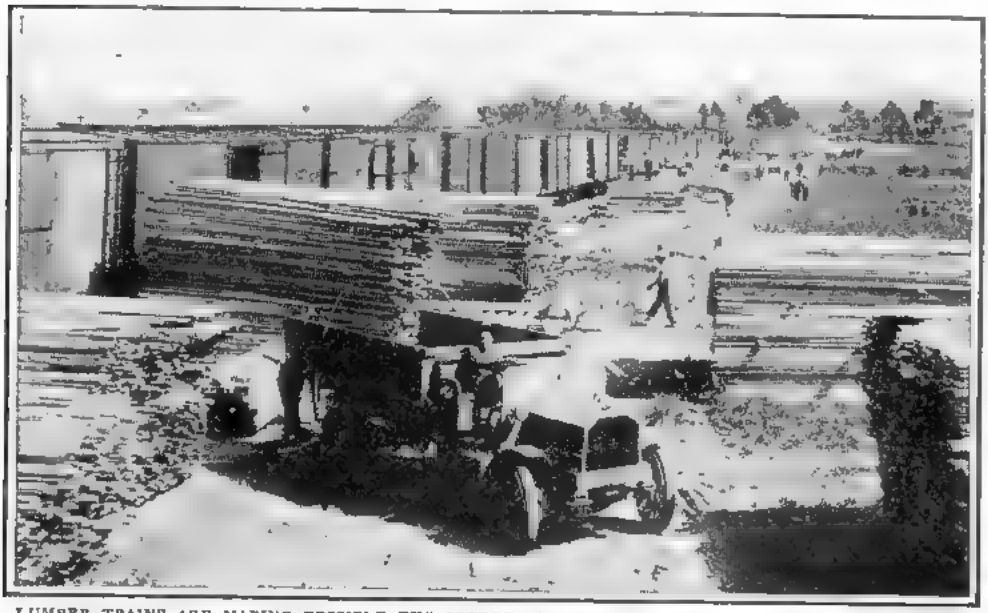
"Push 'em through!" is the yard slogan everywhere, and railroad men have never worked at higher speed or with greater personal credit than at the present time.

An indication of what the progress has been is found in the figures dealing with the very first month's actual operation under the War Board plan, when eighty-two principal coal-carrying roads handled 142,157 more car-loads of bituminous coal —approximately 7,100,000 tons—than in the same month of the previous year.

The daily average of cars loaded with soft coal each working day in that month was 28,449, an increase of 23.8 per cent over the same month in 1916.

On some individual roads the gains were phenomenal. The New York, New Haven and Hartford broke all its records in the handling of all-rail coal-cars, handling 17,168 in one month. This, with the tide-water coal-cars handled, meant a total of 21,850 coal-cars manipulated on this one line in a single month.

Many other roads did quite as well, in response to the bugle-call from Washington. Chairman Harrison says: "With an increase of equipment of only three per cent the railroads rendered nearly twenty-six per cent more freight service in June



LUMBER TRAINS ARE MAKING POSSIBLE THE SPEEDY ERECTION OF TRAINING QUARTERS FOR UNCLE SAM'S SOLDIERS. TO THE CANTONMENT AT WRIGHTSTOWN (NEW JERSEY) ALONE 26,000,000 FEET OR 1,325 CARLOADS OF LUMBER WERE TRANSPORTED.

Photo by courtesy of the Railway Age Gazette.

this year than in the same month a year ago."

Not only did the roads fight desperately to move coal, but they made strategic plans for the saving of fuel supplies. Every pound of coal saved was a pound to the general good. And here are some of the methods that the roads are using to save coal:

Saving Fuel.

They are consolidating, wherever it is possible, through passenger-train service, and are eliminating trains which are not well patronized. No longer do palatial trains burn black diamonds over long routes for the exquisite comfort of a few riders.

No, sir! The passenger-trains of to-day must carry a fair number of riders, or the train is taken off.

And, also, the special-train craze, operated at excursion rates, however delightful the occasion for the passengers, has subsided. In the face of war we have no use for excursion-trains to-day.

On light-traffic branch lines, where two trains a day normally have operated, one train is now made to do, the public being made to accommodate itself to the conditions.

Many an all-passenger train has become a mixed train on branch lines, thus making a pound of coal go the maximum limit of service. Where scheduled freight-trains have not carried sufficient tonnage to warrant the coal expenditure they are taken off.

Double-headers for speed are no longer popular, locomotives thus being released for freight service.

Cut Down "Eats."

Luxuries are being cut out right and left. The observation-car is no longer an object of boasting—it is something that is very nice indeed in its place, but it is in the way of war business.

The bills of fare, in the dining-car, it may be mentioned, are no longer so luxurious as to give crowned heads the "pip," the 1917 railroad restaurant serving a passenger with a slice of beef cut to fit his appetite rather than his eye.

Railroad freight and supplies are being moved on unloaded trains, while work and construction trains are used in slack hours. Every moment of slack time is consumed in storing fuel.

Train performance is more closely checked than ever before, and the maximum effort is made a personal matter with division officials and train-yard crews.

What the elimination of 200 superfluous passenger-trains means, as in the instance of one Eastern road, is given in a report showing a saving of 335 tons of coal each week-day and 44 tons on Sundays—an annual conservation of coal amounting to 106,828 tons.

If four tons of coal will carry the average family of five through a winter, the saving of fuel on this one road alone means that nearly 135,000 persons may be kept warm next winter on coal actually economized through the elimination of unnecessary trains.

All of the roads of the country are saving at the rate of more than 2,000,000 tons of coal this year, by such means as those described here.

Big railroading, eh?

Heaping Measure.

Three thousand cars of cement, coal, slate, and limestone were checked on one railroad to ascertain what progress was being made in the campaign for heavier loading, and the result was that every car was found to be carrying more than marked capacity.

One road hauled 2.92 tons more per car in April, after the War Board order had gone out, than in the same month of 1916, thus saving on this one road the use of 58,473 cars.

In the month of May the same road hauled, 1,414 pounds more of less-than carload freight per car than in the same month last year. This saved 6,319 cars.

Inspectors were sent out all over the country to watch loading. Twelve copper companies were found loading under capacity, and were notified of the seriousness of their acts. Lumber companies were similarly notified that from patriotic reasons alone they should load cars to capacity.

SO WELL ORGANIZED WAS THE PASSENGER EQUIPMENT OF OUR RAILROADS THAT THE MOVEMENT OF TROOPS FOUND IT FULLY EQUIPPED AND READY TO HANDLE THE ADDED BURDEN WITHOUT FEELING THE PRESSURE.

It is interesting to note in this relation that the railroad tonnage this year is breaking all records in history. The annual reports may show as much as a twenty-five-per-cent gain.

Saving 25,000,000 Miles.

It is estimated that the railroads of the country have eliminated passenger-trains aggregating more than 25,000,000 miles of train service per year, and of course this not only results in great coal economy, but also releases thousands of men for urgent needs and also offers a tremendous amount of motive power for freight movement.

"Nothing is more necessary at the moment to insure the safety and prosperity of the country than that the railroads be able to handle the utmost possible amount of freight," said Fairfax Harrison.

And that is the message that is being heeded.

Here's a specimen of the responsiveness of the roads to the call of the War Board:

When the order for a mobilization of the nation's freight-cars, especially for coal and ore, was given, 36 separate roads shipped immediately 68,814 freight-cars to 54 other roads, the cars being moved without load and in the quickest possible time.

Among the immediate and important results of the new and hitherto unused plan of redistribution of cars was the increased facilities afforded for the prompt shipment of lumber to the sixteen army cantonment sites and the ship-building yards. Lumber for the army camps was supplied from the Carolinas, Florida, Alabama, Mississippi, Louisiana, and Arkansas. Thousands of extra cars were supplied to the lines operating in those States.

At one of the military cities, Wrightstown, New Jersey, 26,000,000 feet of lumber were transported by the railroads in 1,325 cars, to house 40,000 of our nation's future soldiers.

As Mississippi and Alabama are supplying the bulk of the lumber for the new wooden ships being built, a great fleet of extra cars was ordered to those States to assure prompt movement to shipyards.

Helping Mr. Hoover.

By the time the government got around to its plans for a war distribution of the mighty flood of grain from the middle West

GONDOLA CARS MUST HAVE DROP ENDS, THE WAR BOARD HAS ORDERED. AND WHERE THESE ARE NOT AVAILABLE, FLAT CARS ARE SUBSTITUTED FOR GUN AND WAGON TRANSPORTATION. FROM THE VERY FIRST TROOP TRAINS AND EQUIPMENT HAVE ENJOYED THE RIGHT OF WAY OVER ALL OTHER TRAFFIC.

Photo by Underwood & Underwood.

to the East, the railroad plan was all complete. Never in the past has grain moved so rapidly from the field to the miller and the cities as this year.

A total of 106,033 empty cars were ordered moved from one railroad to another, regardless of ownership, to facilitate the prompt movement of grain and food products, as well as lumber and munitions, during July and a part of August.

The first big order of empties to the grain country called for a fleet of 7,800 cars.

To protect the movement of sulfur for the munition factories, a large number of cars were ordered to the Kansas City Southern, the Southern Pacific, and the Gulf Coast Line.

More than 1,000 empty stock-cars were sent into Texas, at one time, to aid in the movement of cattle from ranges to pasture country.

Wonderful Transportation Feats.

An example of what was on the food-transportation card, in this respect, was given in the wonderful railroad performance in bringing to the North the potato, onion, and other produce crops from Texas and the Southeast, relieving semifamine conditions in the East.

Similarly there has been an amazingly rapid movement of live stock, not only to the great stockyards, but from the range country to the pasturage territory of the middle West for fattening purposes.

When Mr. Hoover got his commission to regulate the distribution of food supplies, not only for the hungry hundred million of our own country, but the hundreds of millions of brothers-in-arms overseas, he found the railroads prepared with complete plans.

Reports from the twenty-three principal grain-carrying railroads indicated that they were in excellent condition to aid Mr. Hoover. Old grain was quickly cleared out of the country elevators to make way for the new crop, and practically all cars ordered for grain shipment were promptly filled.

The disposition of farmers and country elevator men to expedite, rather than hold back, on grain shipments was stated to be gratifying.

There are, roughly speaking, 2,500,000 freight-cars in the country. None of the plans of the War Board could have been effected if these cars were to be operated in the ordinary way.

The situation called for at least 150,000 more cars. They could not be made overnight, nor in six months, nor in time to meet the emergency.

Hence, the success of the whole plan was predicated upon the idea of getting the 150,000 additional car services out of the 2,500,000. Despite the fact that by the first of the new year may see more than 100,000 new cars and more than 2,000 new locomotives introduced into the service, no hope is held out by the War Board of a lessening of the railroad tension.

"I am afraid there will be a continued shortage of transportation," said Howard Elliott. "It is going to continue to be necessary, in the interest of the nation and of the Allies, to use such transportation as there is for the essential things. The public should willingly give up non-essentials. In other words, it is going to continue to be a great deal more important for this country to move food, fuel, iron, and the essentials of life and manufacturing, than to move the so-called luxuries, the things we can get along without in this terrible world crisis. We hope that we are going to be able to move it all, but I think it is only fair to point out the facts and to ask the public's cordial support."

Points for Shippers.

While shippers in general have given excellent support, there are instances of recalcitrant individuals, and the following facts on what car shortage means may be of aid to railroad men who have to deal with the bucking shippers:

An increase of ten per cent or two tons per loaded car is equivalent to adding over 200,000 cars to the number available for public use.

It is estimated that quicker loading and unloading at the 250,000 shipping points of this country would increase the number of available cars by 515,000.

AT THE HEAD OF THE RAILROAD WAR BOARD IS FAIRFAX HARRISON, PRESIDENT OF THE SOUTHERN RAILWAY. SINCE THE BEGINNING OF HOSTILITIES HE HAS WORKED INDEFATIGABLY TO MAKE THE RAILROADS "THE STRONG RIGHT ARM OF THE GOVERNMENT."

Photo by courtesy of the Southern News Bulletin

About 6.5 per cent of the 2,575,000 freight-cars of the country are normally held up for repairs, and any care that is taken of cars will aid the railroads in their effort to reduce the percentage to four per cent, which would release 64,000 cars for service.

Shippers should ask for no more cars than they actually need and at the precise moment they are needed; they should load without any delay and release the cars in the same spirit.

It is estimated that the government is using for its own purposes fully 100,000 cars, and this may continue for months.

Double-decked cars should be used where many sheep or hogs are handled.

Where commercial freight units are half or less than half of the car capacity, and two shipments are destined to the same point, shippers should be persuaded to load the two shipments in the ends of the same car.

At designated transfer-points underloaded merchandise cars may be consolidated, thus avoiding the movement of light-loaded equipment.

Recent tests have shown that the freight-cars of this country are on the average in control of the shipper thirty-seven per cent of the time, only six per cent of that time being accounted for by Sundays and holidays. President Willard, of the Baltimore and Ohio, says that this is a shameful waste, and points out that a car is kept moving only eleven per cent of the time, the balance of the time standing still at terminals, switches, or being moved about in various ways incident to the main movement to its real destination.

Helping Uncle Sam.

Advance notice is given to the War Board by the government whenever orders are placed for more than ten car-loads of materials or supplies. The government also issues orders to the railroads on which the supplies are to be shipped, instructing them to provide the number of cars necessary, and the exact time of that shipment.

To prevent shippers from making selfish use of cars needed by the government, the War Board issued strict orders to the railroads absolutely forbidding shippers to use any of the government-ordered cars for any purpose except the loading specified in the government order.

To assist further in the campaign to keep freight moving on government orders, a new form of envelope in which the way-bills are carried was designed. These envelopes bear the following headings, printed in conspicuous type: "United States Government," "United States Army Supplies," "United States Navy," "United States Shipping Board."

The High Sign to Speed Up.

In addition, the railroads have been directed by the War Board to instruct their agents at all points to stamp or write in a prominent place on way-bills covering less-car-load shipments consigned to officers or agents of the army or navy or of the Shipping Board, the words "United States Freight—Expedite!"

If departments of the government or individual railroads desire to use cards of their own form upon cars to assist in the rapidity of movement of government supplies, they are permitted to do so; and if any shippers are unpatriotic enough to make improper use of the cars delivered to them for government business, they will be investigated and will fall under the censure of the War Board which, it may be judged from the temper of Chairman Harrison in discussing the possibility, would be far from an agreeable experience.

Actual movement of troops found the American railroad fully adequate to meet the emergency, the magnificent array of passenger equipment scarcely feeling the pressure that troop-train traffic brought as an added transportation responsibility.

As a matter of fact the movement of troops has been of very slight concern to the War Board.

More than 600,000 recruits for the draft army, to be transported within thirty days to the cantonments, was a problem which the railroads looked upon as possible without severe congestion of usual traffic.

Of course, the movement of troop-trains and equipment has from the first enjoyed right of way over all other traffic.

UNITED STATES GOVERNMENT

TO BE GIVEN CONTINUOUS MOVEMENT AND NOT TO BE DELAYED

a. Initial.....Car Number.....

b. Point of Shipment.....Date.....

c. Contents .....

d. Consignor.....

e. Consignee.....

f. Destination .....

g. Route .....

.....

(Give roads and junction points through to destination)

INSTRUCTIONS

TO CONSIGNOR:

1. Fill out blank spaces a to g inclusive if practicable. Otherwise to be filled out by railroad Employee.
2. Deliver to railway agent, or representative, when bill-of-lading is signed.

TO RAILWAY EMPLOYEES:

3. The billing on which car moves, whether regular bill or card bill, must be placed in this envelope at originating point.
4. Envelope containing billing must accompany car to destination in custody of proper employee.
5. If car is set out for repairs short of destination, conductor or yardmaster must notify superintendent, giving contents, destination, and consignee. If delayed *twenty-four hours or more*, superintendent must notify consignee by wire through proper channel.
6. If this freight be transferred en route, notation of such transfer must be made on card or regular bill enclosed. The car number and initial into which transfer is made must also be noted in spaces below:

Transferred To ....
(Initial) (Number)

At .....Date .....

Signed.....
(Title)

7. Railway agent at destination after removing contents will promptly deliver this envelope to the consignee.

This traffic is under the direct supervision of the quartermaster's corps. The railroads are given ample notice to prepare for movements.

Officers are furnished with one berth in each standard sleeper, and enlisted men are accommodated three to a section in tourist sleepers.

Baggage-cars must have end doors. The number of kitchen-cars is designated according to the length of the train.

Where tourist sleepers are not available, the rule is that coaches should be substituted on the basis of one man to each double seat.

The gondola cars must have drop ends, else they will not serve; and ordinary flat cars are substituted for gun and wagon transportation if proper gondolas are not available.

Only 150 Pounds of Baggage for Soldiers.

Officers and men are permitted to carry 150 pounds personal baggage.

The orders are strict as to the sanitation and good condition of the cars. Stock-cars are thoroughly cleaned and bedded with clean earth or sand.

Railroad men who are selected to cooperate with the military authorities, in Washington or at the camps or *en route*, are especially honored, for there are distinct regulations concerning their conduct. The Railroads' Special Committee on National Defense advised that men chosen for this service should have a broad-minded view of transportation service and be temperamentally fit to deal with the authorities. The regulation says:

"They should wholly divest themselves of any disposition to work for, or in favor of, any particular transportation line, but should apply themselves solely to the solution of the transportation problem in the manner most satisfactory to the government and in such fashion as can be most effectively executed by the railroads. They are assigned to this duty as transportation experts, and will assist the quartermaster with whom they are serving, not only in the transportation of troops, but in any other manner pertaining to transportation in which their assistance may be required."

In a great variety of ways the railroads have been cooperating with the government in the war enterprise, in addition to the direct service in the transportation of troops, supplies, merchandise for the people, and munitions for the Allies.

An instance may be sighted to indicate a realm of such service. The Department of Labor, which is responsible for the movement of the industrial army in the United States efficiently to meet the needs of the nation, learned that some 50,000 able-bodied men were out of work in Porto Rico and might be brought to this country for industrial service.

The War Board recommended that the men be brought here, given free transportation from the port of entry and free transportation back if they later desired to return, and such men as wanted farm work the railroads agreed to distribute along their lines to farmers.

They might work for the railroads if they desired, after the harvest or before. In no case were they ever to be used to break strikes.

Recommendation was made to the quartermaster-general that free transportation be furnished by the railroads to officers on inspection duty, on presentation of proper orders. United States government transportation requests were supplied to department quartermasters and other issuing officers.

Helping Allies.

In myriad ways the railroads have striven to be of maximum service to Uncle Sam and his Allies in the mighty war venture now on their hands.

One of the biggest and most creditable things that they are doing now is to sacrifice equipment for the railroads of France, Russia, and England, actually giving up ordered locomotives in favor of the nations needing this equipment in the immediate process of winning the war.

When it came to a question of meeting the heavy traffic demands on the Baltimore and Ohio by the use of its new locomotives or giving them up to Russia, which without improved transportation facilities could not vigorously keep up the war against the two

and a half million Germans facing the new democracy, President Willard said without a moment's hesitation:

"Let Russia have them. It may mean 2,000,000 more of our young men to France if Russia is unable to meet her transportation responsibilities. We will make our present equipment do the work, by operating it more efficiently."

Meantime the work of increasing our equipment has gone on steadily. Manufacturers have joined hands with the railways in the common enterprise of giving their Uncle Sam a lift.

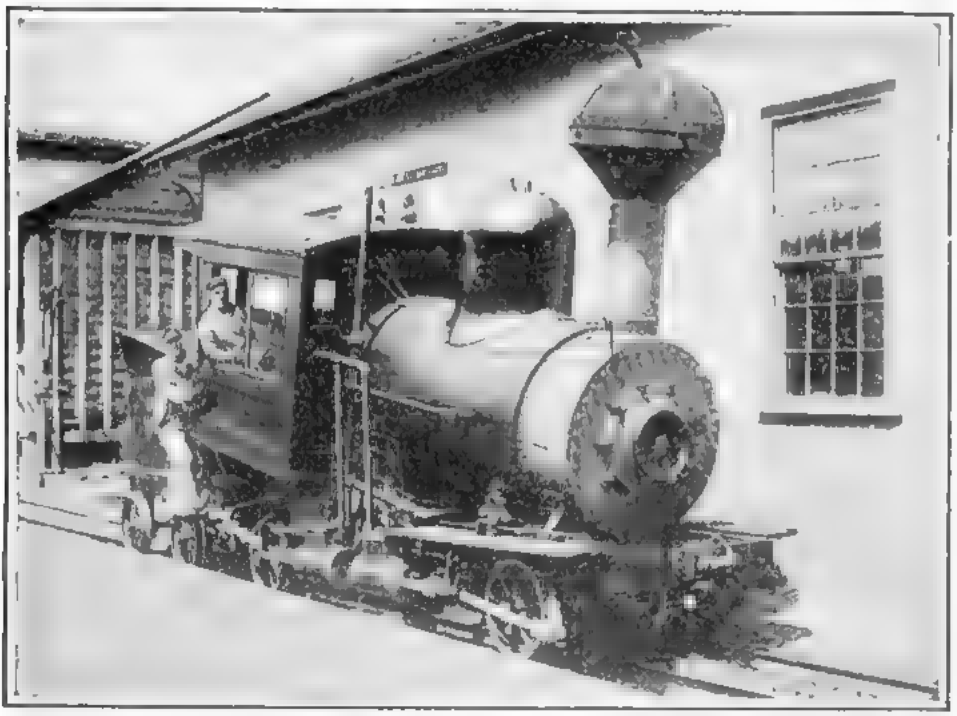
At the Eddystone shops of the Baldwins work is being rushed at fever heat in order to fill government orders for 914 locomotives. The first of these engines, all of which are for service in France, was completed in the phenomenal time of twenty days. It is of the Consolidation type and bears the number 1.

Speaking to the officers of his railroad recently, Mr. Willard made this stirring statement of railroad service:

"I feel that it is a great credit to the railroads of this country that in just five days after Congress had declared war, men representing the 175 principal independent railroads of the United States assembled in Washington, and, after listening to a presentation of the situation, voted unanimously then and there, and signed the paper before they left the city, giving to a small committee of five men, selected by these railroad representatives, full power to control the operation of all the railroads of the United States during the period of the war, in order that the railroads might thereby be in a position to respond immediately and as a unit to any demand made upon them by the President in the interest of the general situation.

"Why? In order that we might best serve our country and so best help to win the war!"

AN ENGINE HAS ITS UPS AND DOWNS.



THIS LOCOMOTIVE LEADS A HILL OF A LIFE ALL IT DOES IS PULL TRAINS UP THE STEEP MOUNT WASHINGTON RAILWAY—WHICH ACCOUNTS FOR ITS LOPSIDED APPEARANCE WHEN STANDING ON LEVEL GROUND. NOTE THE COG-WHEELS.

AN ORPHEUS OF THE SINGING RAIL.

BY FRANK BLIGHTON.

Engineer Dennis Monahan Shows That "Music Hath Charms to Soothe the Savage Beast."

IN public she was generally referred to as "The White Mail." On the employees' official time-card, she was scheduled as No. 9 or No. 10, according to whether she was west or east bound. But among the railroad men themselves, all the way from Big Puma City, on the river of the same name, east to the frowning confines of Stevens Pass, they called her "Singing Denny Monahan's train."

There were other engineers, of course, who pulled her on alternate days or directions; but Denny was the dean of the run, and besides, he had a gift of versification which never failed him. He had been on the road for so many years that even Division Superintendent Mallet, at Comanche Cove, could not have told when the engineman's term of service began, without digging back into the musty files of his office.

Every man and boy on the system between the two points named—which covered some five hundred miles—knew Denny in person and loved him for his genial wit, his wholesome nature and his rollicking Irish way of looking at life on all occasions. But he was best known as an interpreter of his own musical compositions.

His first popular success, "Every Spike on My Run Has a Memory for Me," was esteemed a classic easily comparable to "The Marseillaise," "The Star-Spangled Banner" or "God Save the King," according to the nationality of the guest who heard it. Denny's daughter played the piano, and piped the air in a thin childish treble which suggested the wail of a box car, languishing for lubricant in its axles.

However, no one complained—not even if half the "chune" as Denny called it, had a strong suggestion of "Old Hundred" in the verses, and was plentifully flavored with chords from "They're Hanging Danny Deever in the Morning" in the chorus.

"I niver was much on the no-ats," Denny would explain, "but I'm as full of the lyrics as the wather on this division is of alkali. I am worse than the wather, sometimes. Every time something goes wrong, I have to shoot the lyrics out of me system, or the roof of me head'll fly off like a red hot crown-sheet when the live stheam hits it."

In the ensuing years Comanche Cove expanded to a fair-sized little desert city, of some thirteen thousand inhabitants; Denny went on railroading and riming. And now Superintendent Hugh Mallet, six feet three inches in height, built like a wrecking-crane in physique, and as alert as any Apache scout who ever flattened himself against the barren rocks of the Chuckawalla Range—which was still shimmering in the incinerating sunshine of the mid-July day—was standing on the platform at Comanche Cove, awaiting the arrival of No. 10, eastbound, which was five hours late.

Singing Denny was known to be in the cab.

It was unprecedented, but not entirely unexpected.

For a little farther down the stretch of concrete platform stood two men; each apparently as much interested in the non-arrival of the White Mail as the division superintendent—with this difference: Bud Bowers was erstwhile foreman of the

boiler-shop at Comanche Cove, and Jack Crowell was third vice-president of the Brotherhood of Blacksmiths, who had come down from San Francisco to adjust a grievance; and Bud wanted the White Mail to be as late as possible, while the superintendent wanted exactly the contrary.

Likewise, there was no noisy clamor emanating from the red-fenced inclosure three hundred yards down the tracks, where the boiler-shop, the blacksmith shop, the machine-shop and other buildings devoted to repair-work clustered near the roundhouse.

For the first time in the history of the Tidewater and Lake City's system all the shopmen had quit—cold. They had quit on this division point only; and in one of the oddest strikes ever pulled off on any railroad system in the United States.

Likewise, incongruous as it may appear, they struck for reasons which arose primarily not because of any differences in the agreements between the railroad and the brotherhoods as a whole, for every other shop in the system was working and would continue to work. Indeed, none of the boilermakers, blacksmiths or painters admitted having any grievance at all—simply the machinists, and even these were not against the system for violation of any contracts mutually entered into; but, instead, because the cost of living in Comanche Cove had soared so high since the machinists' wage-scale had been signed, that the pay envelopes of these particular employees were now barely adequate to allow the men living there to meet the demands of their families.

The machinists, therefore, had struck when Angus McQueen had been "garnished" by a local Shylock who made a practise of raiding the pay envelopes of the machinists, in particular, on the slightest possible legal provocation; in this instance, an overdue item of less than five dollars—with costs and fees aggregating fifteen dollars more.

Angus McQueen was a contemporary of Singing Denny in point of service and much older in years. Also, he had an invalid wife.

When the constable of Comanche Cove, therefore, rudely seized on the old fellow's pay envelope and helped himself to almost a third of its contents the day before, the indignation of his fellow workmen rose so high that they demanded of Division Superintendent Hugh Mallet that restitution be made of the exorbitant fees thus taken.

Hugh Mallet sent for the road's attorney. His own sympathies were all with the men; no one realized more than he the struggle this class of employees had to face in order to "make the pay check cover expenses"; and so when the road's legal adviser assured him that the operation was within the scope of the statute, Mallet was madder than any of the men.

However, as he could do nothing, the long pent-up resentment of the men rose so high that the machinists made an issue of the whole garnishee incident; inflammatory speeches were delivered and they voted to walk out.

The infection spread—for McQueen's wife was very low at the time of the spoliation of her husband's slender stipend—and before anything could be done to stem the tidal wave of aroused sentiment among the balance of wrathful shopmen, the boilermakers had voted to walk out in sympathy, and had been joined by the blacksmiths and painters.

Whereupon, as in duty bound, Division Superintendent Mallet offered to arbitrate the matter, under the general agreement, and ended by telegraphic appeals to the superior officers of the brotherhoods involved. Thus Crowell had come down to investigate.

At that time it was pointed out to Crowell by Superintendent Mallet that, in matters of purely local jurisdiction, the grievance complained of should first be voted on by the local brotherhood. Moreover, the railroad officially could not take any action with reference to the existing agreement as to local wages, without thereby automatically increasing the scale for the entire system. Hence Mallet was utterly powerless. The latter expedient, besides, owing to certain clauses in the agreement, could not be invoked as it would

have cost the road millions; it was besides totally unnecessary as all other machinists on the system were perfectly satisfied with the wage-scale; only in the case of the Comanche Cove men was there any local grievance of any kind— and this one was entirely outside of Mallet's authority.

To complicate matters, Mrs. McQueen died within a few hours following the raid on her husband's pay envelope by the greedy local officials; and thus was intensified a bitterness among the men which far exceeded for the moment any rage of painted Apache warriors in the early days of Singing Denny's apprenticeship on the Tidewater and Lake City system's southern parallel.

This then was the situation when that renowned rimester rolled somewhat uncertainly into the yards—five precious hours late. Usually the veteran driver was so strictly on time that the office boy up in Mallet's private boudoir would unhesitatingly have corrected the electric clock by the train's arrival, had any small discrepancy existed.

To-day, however, there were other equally untoward, not to say curious phenomena surrounding the train's belated schedule; not the least of which was the peculiar odor that the No. 1763 Atlantic-type locomotive radiated. The Atlantic type was in general use on the fast runs of Comanche Cove, because of the level contour of the road between there and Big Puma City; to the east the Pacific type was used, with a smaller diameter of wheel and three drivers instead of two, for hill-climbing.

The odor was most unlike No. 1763's usual aura of vaporizing steam and lubricant; neither was her air-pump drumming like the hot heart of a runner who has breasted the tape in record time. On the contrary it worked in a most intermittent and asthmatic manner—as if the beautiful piece of mechanism were as semi-moribund as some tourist, shattered in health, who had sought the ultra-dry, germless climate of the desert country in search for the boon of the strength and vigor it afforded.

"Do you get that sniff?" asked Bowers, turning to Crowell.

"If I haven't got a head-full of dead cinders like those cold forges down there," returned the official with a perplexed expression, "it's the same smell that used to float out of old Deacon Stebbins's back door when I was a kid shoveling snow off the sidewalks in Schenectady. Isn't it a gruel of some kind?"

Bowers had no need for a reply. Just then No. 1763 gave an explosive sigh, merging into an apologetic cough, as Singing Denny drew back the throttle lever. With the first blast from her stack something steamy and flaky whisked through the exhaust orifice, jetted straight up into the air and sprinkled the two men.

"Have a little free lunch," laughed Bowers to the puzzled brotherhood official. "This is oatmeal. They're using it to plug the leaky flues, along with the boiler compound, to get the mails over the line, on time. Can you beat it?"

"Tell me about it," said Crowell, as they turned back toward the lodgeroom of the local shopmen. "But before you begin let me tell you something. You boys are all wrong down here."

"How wrong?" demanded Bowers.

"Every way. This strike is wrong. It ought never to have been brought. I grant you that the personal provocation to poor old McQueen is the worst I've ever seen. But the grievance is one that could not come within the agreement And the grand lodge—"

"The rule says the local brotherhood has jurisdiction," returned the boss boilermaker hotly. "See here, Mr. Crowell, if you go around the town you'll learn something.

"Old Angus McQueen worked for this road for more than thirty-five years. He was robbed of fifteen dollars before he could get down to a grocery store to pay a bill of less than five—robbed because there's a sneak in Hugh Mallet's office that tipped off the gang of vultures down in lawyers' row just when to garnishee a poor old man—"

Bowers broke off in sheer incoherence due to his anger at memory of what had transpired. Crowell on the contrary remained cool and judicial.

" The brotherhood law says that the local shall have jurisdiction and authority to call out the men to adjust a purely local grievance, until its action is reviewed by the grand lodge committee.

" Now, I've got to wire a report to-day. I've got to be square with the road as well as with you boys.

" The grand lodge committee will meet day after to-morrow and declare this strike unauthorized. The clauses of the agreement haven't been violated. McQueen has my sympathy—so have all the other machinists. But we couldn't foresee that Comanche Cove, of all places on this system, would turn out wage conditions unprecedented.

" However, you can't go to shooting a road's equipment all to flinders just because some legal bloodhound grabs a man's pay either—that isn't in our agreement. Why, man, where would our wage-scale contracts wind up, if we recognized and sanctioned any such action as that?

" Now, here's my advice: call the boys together and get back to work before we have to send on men from the other jurisdictions to keep the road's motive power up to standard and to let them run trains on schedule. By the way, what are they using that oatmeal for?"

Bowers explained. The water for some five hundred miles of the system was so impregnated with alkali that it was only by constant and liberal use of " boiler compound " that it could be made suitable for steaming purposes at all. Without it the alkali induced " foaming " to such an extent that water would enter the dome itself, and pass through the throttle orifice, down the feed-pipes into the cylinders, with disastrous results.

" Every six round trips that Singing Denny makes with his run, for instance," said Bowers, " we have to let that No. 1763 cool off, and then plug up the leaks where the flues work loose from the boiler-head. We usually swedge 'em a few times; then we examine the bent or busted stay-bolts, replace them, and then go over the crown-sheet to be sure none of the bolts there have leaks in 'em. Otherwise, the engine will go dead on the road.

" The reason why Singing Denny smelled like an oatmeal boiler this morning was this: his engine ought to have gone in to the shop to be fixed up yesterday, when he took her west. She had to take a chance, because the traffic's been heavy lately and there didn't happen to be a good-order locomotive passed by the Federal boiler inspector, who's here on his semi-annual trip.

" By using a lot of oatmeal in the water, if there's a pin-hole or two in the flues, the meal will work into it, burn over, harden and act like a cement. Otherwise, Denny could sing himself hoarse as a bull-frog, and still the blow-back from even a little one might put out his fire."

" I see," nodded Bowers. " Well, Bud, you'd better get these fellows together and call a meeting to order. You're all in Dutch enough now. Let's get this over with. It's a mighty painful ceremony, after the way you hot-heads have busted things wide open down here."

Oddly enough the man most concerned, upon whose wrongs the whole turbulent affair was pivoted, uttered not a word of protest when he heard the decision of the delegate from the grand lodge of affiliated brotherhoods. Angus McQueen was in one way the most unconcerned person in the hall.

He seemed too dazed to remonstrate, even if so inclined.

When it was all over he walked quietly back to the little house where he and his wife had lived for so many years. Sympathetic neighbors attended to the details of the funeral.

There was a wreath of flowers from the altruistic, if misguided, men who had stood by him in the most effectual manner their limited experience afforded in the way of a remedy for his wrongs.

The day of the interment a delegation left the shops to attend; and everything that the kindly neighbors could think of was done to dull the keen edge of the blow which the old machinist had undergone.

It was quite natural, notwithstanding his necessities, that Angus should not go back to work immediately. His absence aroused

no comment during the first day or so. Then as the desolated little brick dwelling still showed no signs of life his friends investigated.

Angus McQueen was nowhere to be found.

There was not a scrap of anything to indicate how, why, when or where he had left. Inquiry brought no result. Singing Denny heard the news when he started west on No. 9, on his regular run.

"Pore old Angus," he mused. "Many's the day we've chummed around together. I wonder if the old feller has coyotes in his brain-coop? He sure took his wife's death hard.

"Well, here's hoping he'll turn up safe and sound. There's few enough of us old-timers left around here."

And with that he mounted his engine and speeded the White Mail with its tail of luxurious Pullmans across the caliche borderland, beyond this to Dead Man's Valley, at the far rim of which in turn Big Puma City crouched on the banks of the river of the same name, as it had crouched since the day the surveyors had given the townsite its cognomen from the overzealous beast which had attacked their camp, when the vanguard of civilization-to-come was threading its first timorous way through the vast wastes.

Bill Appleton, who sat at the firing-valve, noted, however, that Singing Denny rather overindulged his usual pastime of singing several verses of "Every Spike on My Run Has a Memory for Me," and he seemed to derive a peculiar pleasure in one verse particularly.

"What d'ye think yuh are—a cabaray?" demanded Bill with a grin, after Denny had caroled the offending stanza at least seven times during a "meet-order wait" which necessitated quite a liberal recourse to his detention card. "Spring a new verse or two, if you're looking for applause from this part of your audience."

"All right!" grinned Denny, peering down the line toward the gradually growing spot of light where the delayed freight was crawling toward them on the main line. "What do you think of this new ballad?"

He stuck his head out of the cab-window, and caroled in a very creditable barytone voice to the silent, moonlit stretches of desert, on whose silvered breast were penciled somber shadows cast from the cacti and mesquite in the stilly night:

"I've been a running on this road fer more than thirty year;
I've never pulled a dirty trick nor never will a queer
But, Buddy Bowers, I think I know just how you fellers feel
When I come in with Number Tin, a smelling of oatmeal."

"You ought to quit railroading and open a roof-garden," jeered the fireman.

"You're jealous!" grinned Singing Denny. "Thry this on them new overalls of yours:"

"There's spots on me division where I make me ninety mile;
I wabbled over them that day like a lame cow climbs a stile
Me flues were leaking like a sieve, they liked to douse me fire;
Me drivers rolled along the rails like wheels hub-deep in mire."

A shrill, high-pitched laugh echoed wraithlike from somewhere out of the desert, just as Singing Denny was in the midst of his usual apology:

"I never was much on the no-ats but I'm as full of lyrics as the wather—"

"What in Tophet is that?" growled Appleton.

Singing Denny manfully suppressed a shudder.

"I never heard of a banshee so far west as this," he said after a moment or two of prolonged, tense silence. "Maybe," he continued, rather lamely, "it was a laughing coyote."

"Coyotes don't laugh," returned Appleton, again peering perplexedly out across the moonlit vista on his side of the cab. "You're thinkin' of hyenas."

"I was not!" the engineer assured himself, as he "whistled in the rear man" when the east-bound freight was almost in "the clear," and rolled gently on as their own head brakeman gave him the "come-on" flash from his lamp. "I was thinking of poor Angus McQueen. I'd know that laugh of his in heaven or Hades. But

where is he, if it is Angus and what's he doin' away out here in th' middle of nowhere?"

They tore on into the sepulchrally silent night and at last whistled for Casa Grande. Here, to his surprise, the distance signal of the first block as he bore down upon it displayed the "caution" light; and when he entered the station block itself, the lurid red of the "stop" signal, like a malevolent, evil eye, forbade further procedure until it changed hue.

Singing Denny brought his train to a stop and sighed.

"There's no luck in th' wail of a banshee!" he muttered, dropping to the gangway and thence to the ground, when the night operator appeared in the doorway with a new train-order.

"Extra west-bound freight No. 2751 has gone dead three miles west of here. They're sending a relief engine up from Mormon Crossing," explained the brass-pounder. "You've got time enough to write another song!"

Monahan signed the book, comforted the fuming train-conductor, lit his pipe and strolled forward toward the shadows of the big water-tank for a smoke and to avoid the radiation of heat from his engine until the semaphore should swing to "proceed."

The tank was barely ahead of the pilot of his train. He seated himself on one of the big transverse timbers and his thoughts wandered back across the gulf of years. He was thinking of Angus McQueen —then a braw Scottish lad with a burr that gave his speech a pleasant flavor amid the flatter dialects of the frontier.

"I wonder where the poor old divil is, anyway," said Singing Denny.

Then, warned by a premonition for which he could not account, he turned around.

A half-naked figure was stalking him through the gloom from the far side of the tank's structure. In one hand it balanced a big army pistol, pointed menacingly at his breast. In the other it carried a small bag

It was Angus McQueen, beyond peradventure.

Stripped to the waist, save for a shirt which flared open, smeared with the dust of the desert or that flung up by the flight of Denny's own train, with trousers torn by mesquite barbs, eyes rolling in a frenzied fashion that was more terrifying to his old friend than any banshee that ever haunted his motherland, the aged machinist was a frightful and revolting spectacle.

"I know you, Denny," hissed the specter, "and if you open your trap to yell I'm going to blow it off—with this."

Singing Denny concluded to comply temporarily with the delicate intimation for silence. That, in fact, was the first coherent thought which penetrated his cranium.

The second was that here was a rich, rare and racy chance to add not one but several new verses to his immortal ballad "Every Spike on My Run Has a Memory for Me," provided the obviously insane mechanic would permit him, in due time again to indulge in the dual occupations of "pulling a plug" and ejecting the involuntary lyrics from his system.

"I've got a little boiler compound here," went on the unkempt figure, waving the bag he was carrying. "Something that'll stimulate this soulless corporation that hires clerks to rob pore old men with dying wives to help keep their memories green!"

He burst into a paroxysm of tense but almost inaudible laughter. Its demoniac prolongation left Dennis Monahan more perturbed than before.

"Yes," went on McQueen with such savage satire that he seemed quite another personage entirely, "Maggie and I would have lived out our little lives in comfort on my pension if it hadn't been for that hound Piper, chief clerk to Hugh Mallet. It was Piper that telephoned down to Jim Townsend, the constable, and told him the names of the machinists in the shops that had a good balance coming on pay-day.

"It was Piper that got half of the fees that the officer of the law took from us old-timers because he had the law on his side!

"Well, Denny, I'll show 'em. They won't need so much compound for some of their boilers when I get through with 'em. See this—"

He waved the bag.

"That's *my* compound. It works fine. I slipped just a handful of it into the tank of that Extry No. 2751 that's gone dead up ahead of you. That's why the White Mail's laid out! *Compound!* Oh! Ho! Ho! Ha! Ha!"

He was again chuckling most venomously but still so cautiously that neither Appleton nor the operator, scarcely fifty feet distant, comprehended aught of what was transpiring.

Singing Denny was nonplused.

If he opened his mouth to cry out the deadly pistol still carefully poised at his heart would terminate his life then and there. If either Appleton, the operator or the head trainman took a fancy to walk up toward the tank, and the lunatic with the gun happened to resent their approach, they would walk to a like doom.

Cold sweat broke over Singing Denny's forehead.

All the tales, mythical or true, of his earlier adventures along the line of the Tidewater and Lake City's southern parallel, faded before this crafty yet sinister figure, which with a madman's acuteness was still covertly watching his slightest movement as if only waiting some slender excuse for carrying out his first threat.

The red semaphore ahead continued to glow—only it was now more than ever like the eye of the Evil One.

For the first time in his long and eventful life Singing Denny's brain refused, for a time, to harbor even one vagrant rime.

Instead, he was thinking how eminently appropriate it was that his satanic majesty was usually depicted wearing garments that not only fitted him exceedingly well, but that also were of the same hue as the "danger signal" common to all transportation systems.

Then with a revulsion that swept aside everything else Dennis Monahan felt an overpowering desire to sing.

As Singing Denny he had lived and as Singing Denny he would die, if die he must this refulgent night—with a song on his lips—*the* Song of Songs along the railroad.

He would sing the song that had made him famous from Big Puma City to Casa Grande; from Casa Grande to Comanche Cove; and thence on to the east, where the frowning confines of Stevens Pass hurtled back the roar of the trains he had pulled on the eastern division, as well as the west.

And so Singing Denny threw back his head, permitted the old brier pipe to drop into his big palm, and crooned the first verse of "Every Spike on My Run Has a Memory for Me," in a rich but very subdued barytone, that would have brought tears to the eyes of a brass monkey-god squatting in a sacred temple of East India, but which brought only a sniff of disgust from fireman Bill Appleton, who had heard it so often of late that he began to have his own private doubts as to whether Singing Denny ought to be trusted with such an important run as the White Mail many years longer.

Bill hissed something to the operator and the fireman entered the station.

Denny threw back his head a little farther as he reached the chorus. He could see the trainmen's and the conductor's lamps twinkling like yellow stars of the first magnitude amid the purple shadows of the station.

They, too, would not come nigh the place where death lurked in the shadows. And for this he gave transitory thanks in the imperceptible pause between verse and chorus.

He raised his voice from the low, soothing, crooning timbre he had begun the verse and sent it, firm and sustained, along the line of the steel mail-cars just behind his engine, past the baggage-car and the diner, where the tired negroes reclined with heads at the screened windows—down to the last open window of the farthest Pullman, in accents whose fervor was unmatched by any previous audience who had honored him by a request to hear the ballad:

"Every spike in my run has a mem-o-ry for me,
Every whistle-post I see holds an old friend's face;
Every hill that I climb brings an incident to mind,
Every bridge that I cross is an old, fa-mil'iar place.

Every curve in the track brings a recollection back
Of the days that have fled and the boys who are dead;
Every mile that I wheel only helps me more to feel
That my run is nearer done than the day before—by one!"

The spell of the stanzas seemed to hypnotize both the singer and the madman who stood so perilously close to him. Singing Denny, however, did not unclose his own eyes. He kept on with the second verse, in the same soothing, crooning fashion; and then the chorus again with all the fervor at his command.

At its conclusion he peered at Angus McQueen.

The old machinist was leaning against one of the massive uprights which comprised the supports for the ten-thousand-gallon water-tank placed there to replenish the freights.

The menacing pistol was hanging inertly by his side; his other nerveless hand relaxed its grasp on the little bag, which fell at Singing Denny's feet, disgorging its purplish contents in the uncontaminated moonlight so vividly that the engineman instantly recognized it for blue vitriol, the substance used by telegraph operators in their local batteries to strengthen the main-line relay current, when passing it on to the sounder.

The gruesome meaning of the phrase "new compound" fairly whistled through his overcharged brain. Instantly Dennis Monahan comprehended why the freight-engine up ahead had "gone dead."

It was only by a special Providential interposition that it had not exploded and torn the right-of-way into fragments, as well as annihilated locomotive and engine-crew.

For this substance, when any very considerable portion was dissolved into the water of the tender, superheated and injected into the boiler, would instantly have corroded the weakest spot in the boiler. If a flue, the live steam might "kick back" against the semi-incandescence of the oil-jet.

It would be a toss-up whether it reached this or the under side of the glowing crown-sheet of the firebox first. In any event, it was almost tantamount to squirting a solution of nitro-glycerine into the firebox itself.

Dennis Monahan suppressed his first impulse to seize on the weapon, wrest it from the madman, and splinter his skull with it, as all of this flashed like a meteor through his lyrical repository.

Instead, he closed his eyes again, and without the slightest indication of umbrage at the horrible concept which the overwrought brain of the machinist had spawned, he said mildly:

"I've just thought of a brand new verse, Angus. Listen:

"There's women and childer a riding behind
On the thrain where Denny pulls throttle;
They're cooped in the berths, right snug, d' ye mind—
As safe as a toad in a bottle.
If I was a pulling a sthring of ould flats,
I'd take ivery chanst of a squirt in the slats,
From a crown-sheet or two, or a bum, blowed-out flue,
But wid women 'nd childer
Ye've got to be milder—
No matther if Denny makes Mulligan stew!"

He heard the weapon fall to the ground. It was out of sight in the shadows. He turned slowly in the opposite direction so as not to appear to observe the repentant sobs that were shaking the bereaved man's figure.

His watchful eye caught the semaphore in the next block. The "caution" of the green light was just fading to a flawless white.

"Come on, you would-be minstrel!" jeered Appleton from the station door. "Can't you see we're in the clear?"

"Are we indade?" retorted the engineer, rising and strolling casually back to his post. "Well, me bhoy, it's glad indade I am that you have such sharp eyes. Ye see, I'm not much on th' no-ats but me head is full of lyrics as the wather on this system is full of alka—"

"I've got a picture of you one of these days writing a regular opera!" elegantly interrupted Mr. Appleton with a withering smile such as Voltaire might have em-

ployed to turn on Frederick the Great, some years before the Tidewater and Lake City decided to run its southern parallel from the Pacific Coast to the Gulf of Mexico.

He gave the firing-valve a vicious twist and then opened the blower. The asphaltum base of the fuel-oil drenched and blotted out the starlit sky with a huge cloud, as Singing Denny leaned out of his cab window and hissed:

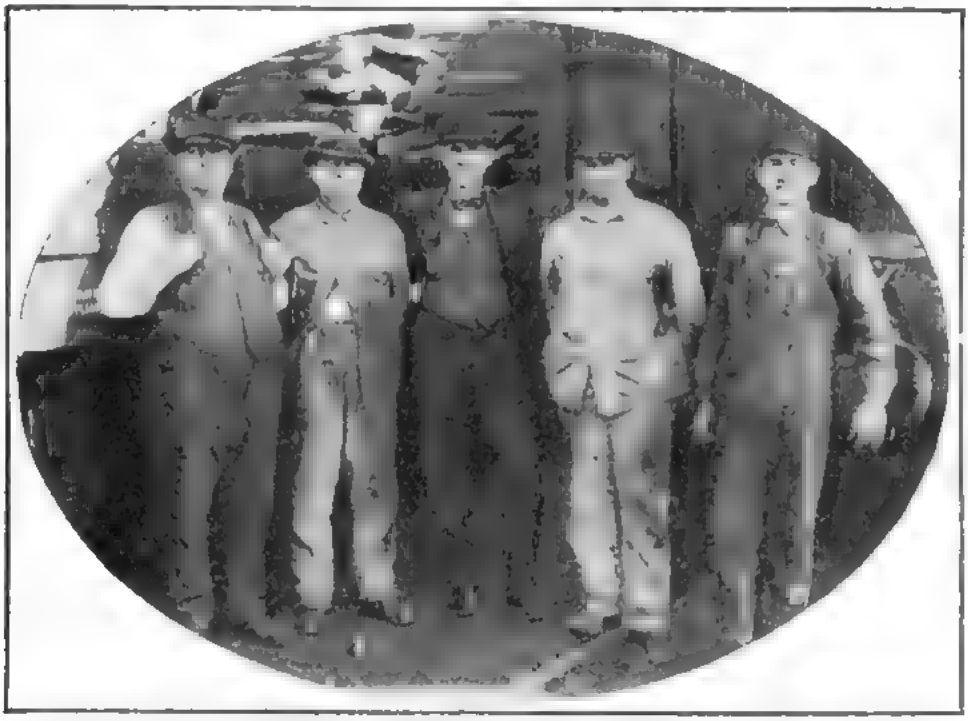
"Whisper, Angus. Climb up behind me and we'll kape on to Big Puma City together—as in the good old days we've done many's the time."

Stifling his sobs, the bereaved mechanic mutely obeyed.

Overhead the air-whistle piped the conductor's signal for the air-test. Singing Denny went from on lap over into service stop, then back to on lap again as automatically as Mr. Westinghouse's most utilitarian invention in operation on steam lines.

"Yah!" jeered Mr. Appleton, ensconcing himself on the cushion opposite. "I've got a picture of your name on the advertisements, too, of that same opera, with the words, 'Lyrics by Dennis Monahan!'"

EVERYBODY WORKS—AND FATHER!



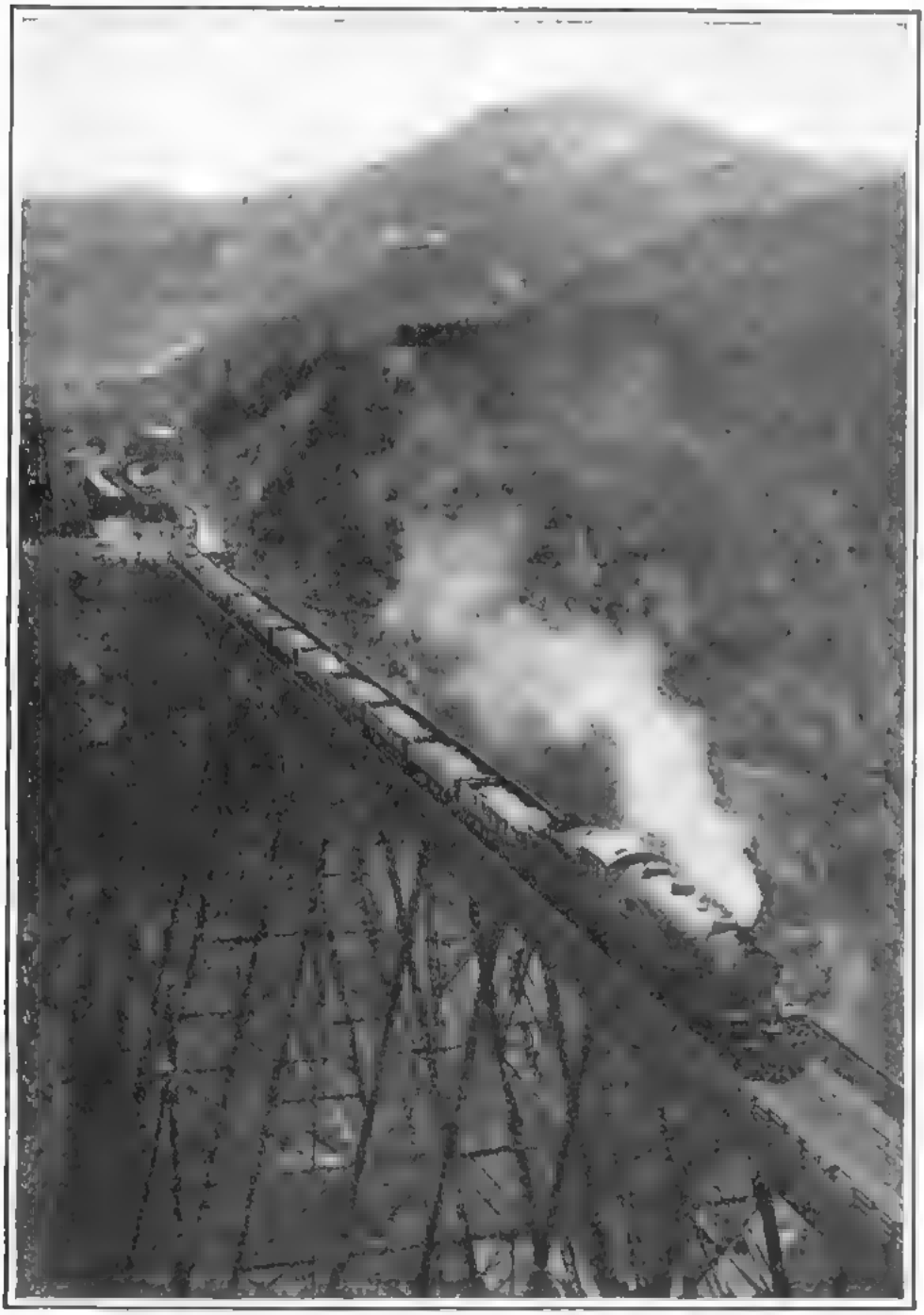
A FAMILY WHOSE SERVICE TO THE SOUTHERN RAILWAY AGGREGATES MORE THAN A CENTURY

RAILROADING may not be hereditary, like red hair or a tendency to squint your left eye; but the White family, whose photograph appears here, seems to have made it at least a well-founded tradition.

Mr. W. C. White, the father, derrick engineer on the Atlanta Division of the Southern Railway, began railroading in 1885, and his four sons followed in his footsteps just as soon as they were old enough.

Father stands on the left. The sons, in order, are Edward, engine carpenter; Harry G., general foreman; Frank, derrick fireman, and Charles, machinist.

SEEN THROUGH THE CAR-WINDOW.



ALL DAY LONG TRAINS LOADED WITH ORE LEAVE THE BUSY BINGHAM (UTAH) TERMINAL OF THE BINGHAM AND GARFIELD RAILWAY. FROM THE MAMMOTH SURFACE MINES OF THIS CAMP, THE BIGGEST IN PRODUCTION IN THE STATE, 13,000,000 TONS OF COPPER ORE WERE CARRIED LAST YEAR

SAM LOYD'S RIDDLES FOR RAILROADERS

WHENEVER we printed a railroad puzzle so many of you responded, and responded so promptly that we thought maybe a regular department might make a hit. Were we right? Tell us quick. If you like puzzles, say so, and we'll keep 'em coming; if you don't like them, vote against them and we'll stop them. The majority rule prevails in this magazine. Drop us a postal now. Or, better yet, show your interest by taking part in the prize contest, rules for which are given in full on page 380.

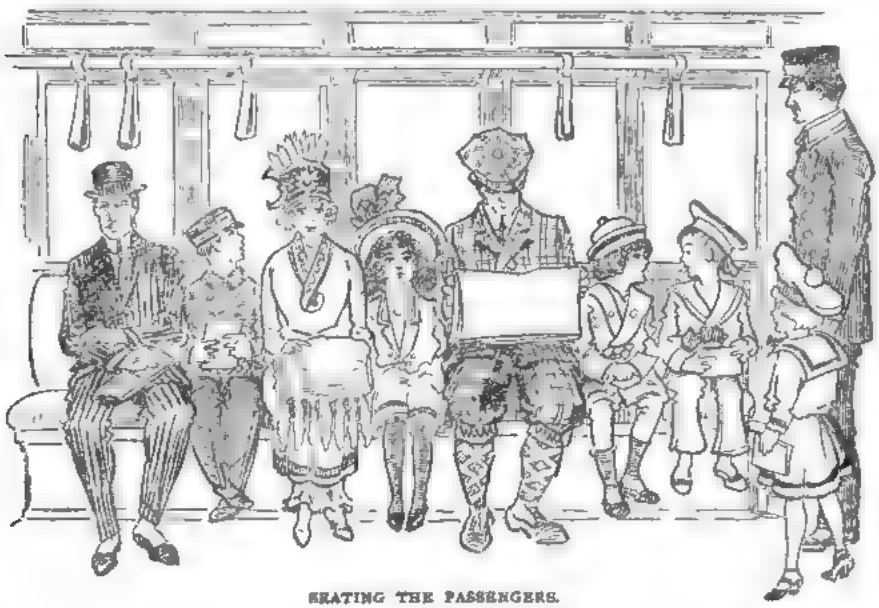
Last month in telling you about Sam Loyd we called him the puzzle-master of the world. This month we *prove* it.

SEATING THE PASSENGERS.

THE opposite side of our dinky-car, as will be seen in the picture, was occupied by three adults and four children, with not enough space left to accommodate a little miss, in whose behalf the conductor spoke as follows:

"This car will seat sixteen children, or it will seat ten grown-ups and four children. The two seats are of the same length, and if you will rearrange yourselves there will be just enough room for this little lady to be seated."

We cannot see the opposite seat in the car, but who can tell from the conductor's speech just how many grown-ups and children he was carrying at the time he made his statement?



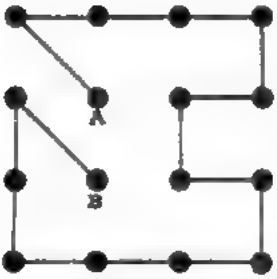
SEATING THE PASSENGERS.

SPEED PROBLEM.

WE traveled from Denver to Omaha on the local at an average speed of twenty-five miles per hour, and returned over the same track on the limited express at the rate of fifty miles an hour. What was the average run per hour for the excursion?

IMPROVING THE SYSTEM.

THIS square township embraces sixteen villages, represented in the diagram by dots, and the local railway system passes through all sixteen in ten straight stretches



IMPROVING THE SYSTEM

of track, starting at A and ending at B.

The engineer who laid out that road failed to grasp a very pretty problem—that of selecting a route which would require only the minimum number of straight runs.

Let us improve his system by laying out a route of straight runs, beginning at A and ending at B, after passing through all of the villages and the road to have the fewest possible number of turning-points.

HANDING IT BACK.

MY friend, the station-agent, and I exchange conundrums, puzzles and other mental fodder. I left him with a hot riddle yesterday and he countered this morning, as follows, when I asked him for the time:

"Just add one-quarter the time from midnight until now to half the time from now until midnight and you will have the correct time."

What time was it?

KILLING TIME.

LITTLE Miss De Peyster missed the three o'clock train for Garden City, so had to wait for the 3.45. She improved thirty of the forty-five minutes by carefully inspecting the new stairway improvements in the Long Island section of the big Pennsylvania Station, the while devouring an entire box of chocolates.

During the remaining fifteen minutes she visited the news-stand and purchased five pounds of current literature; thence to the candy-counter, where she laid in five pounds of candy to tide over the week end. Thus weighted, she stepped upon a penny-in-the-slot machine and was astonished to discover that her weight had increased ten per cent. Then she got busy with a pencil and paper and established the interesting fact that had she consumed twice as much chocolate her gain in weight would have been eleven per cent. How much did she weigh when she arrived at the Pennsylvania Station? And how much candy did she eat?

CHARLIE AT THE TICKET-WINDOW.

I STOOD at the railroad ticket-window just behind Charlie Chaplin. He paid for his ticket and then remarked:

"By the way, can you change a large bank-note for me?"

The ticket-seller gave him a quick appraisal, and, not recognizing the million-dollar funny man, replied:

"Anything you've got."

"Good," said Charlie. "Please break this into 'small-time' change. Give me some ones, twice as many twos, five times as many fives as twos, ten times as many tens as fives, and the balance in twenties."

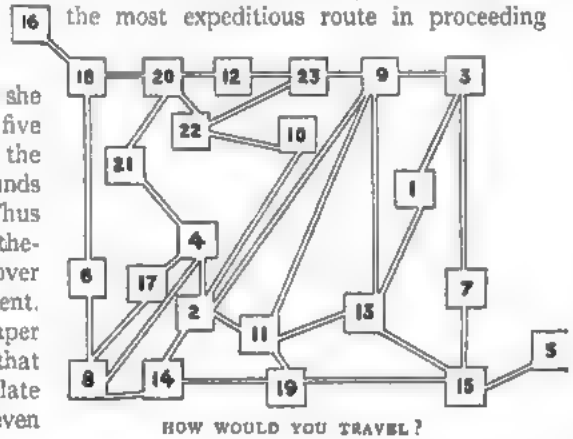
Now what is the smallest United States bank-note that Charlie could have furnished to pay for that change?

THE TRAIN-BOY'S FRACTIONS.

AS we ruminated over some of the train-boy's fruit the following little problem evolved from his scale of prices: An apple and a half are worth three-quarters of an apple and one-half a cent. Half an apple is worth three-quarters of a pear, so what is the fewest number of whole pears that I can buy with an even number of pennies?

HOW WOULD YOU TRAVEL?

IF you were a traveling salesman starting out from Town No. 16 on the railroad map, and your itinerary included every one of those numbered towns, what would be the most expeditious route in proceeding



HOW WOULD YOU TRAVEL?

WRITE out your answers and send them in by post not later than November first to Sam Loyd, care the RAILROAD MAN'S MAGAZINE, No. 8 West Fortieth Street, New York City, New York. Mr. Loyd will publish his own answers in the January issue, and announce the winners of the contest at the same time.

PRIZES FOR THE TEN CLEVEREST ONES.

To each of the ten persons who send the best answers to all of the puzzles will be awarded a copy of the "Cyclopedia of 5,000 Puzzles, Games, Tricks and Conundrums," published at five dollars.

By "best" is meant in the first place, absolute correctness of answers. Then, if minor points of merit must be taken into consideration in selecting the winners, clearness of explanation will be a deciding factor.

Mr. Loyd will examine all letters received and his adjudication must be accepted as final by all contestants.

to your last stop, No. 5? The journey may be described by putting down the numbers in the order they are reached.

A SHORT RUN AND LONG PROFITS.

IT used to be said of the old Coney Island Railroad, which shuttled between Brighton and the West End, that this smallest of steam railway systems declared the highest per cent in dividends of any railroad in the world.

Be that as it may, I recall it was a very short run for one's nickel.

If you are interested in knowing just how long was that trip between the only two stations of the line, perhaps the following data from an old scrap-book will furnish the information:

Two trains, one faster than the other, started simultaneously from opposite stations and met and passed seven hundred and twenty yards from the Brighton Terminal. They remained in their respective stations ten minutes, and on the return trip met four hundred yards from the West End. Now, then, how long was the road, assuming that the trains maintained their respective speeds throughout?

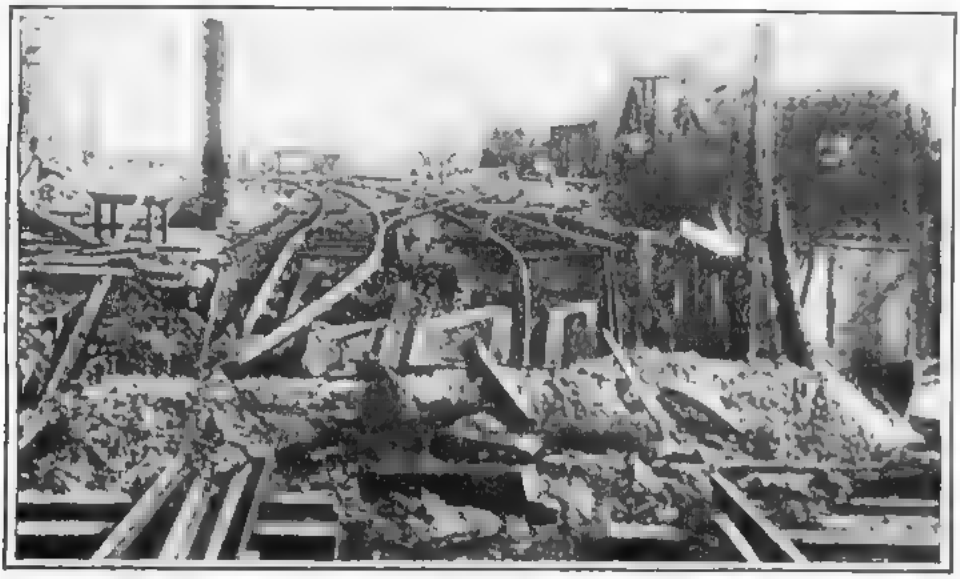
TRAIN WHISTLES.

BY T. J. MURRAY.

THEIR whistles scream for stretching thoroughfares
O'er which they sweep at grade; from far afield
Their signals float upon the midnight airs
To drifting zones of sleep whose portals yield.

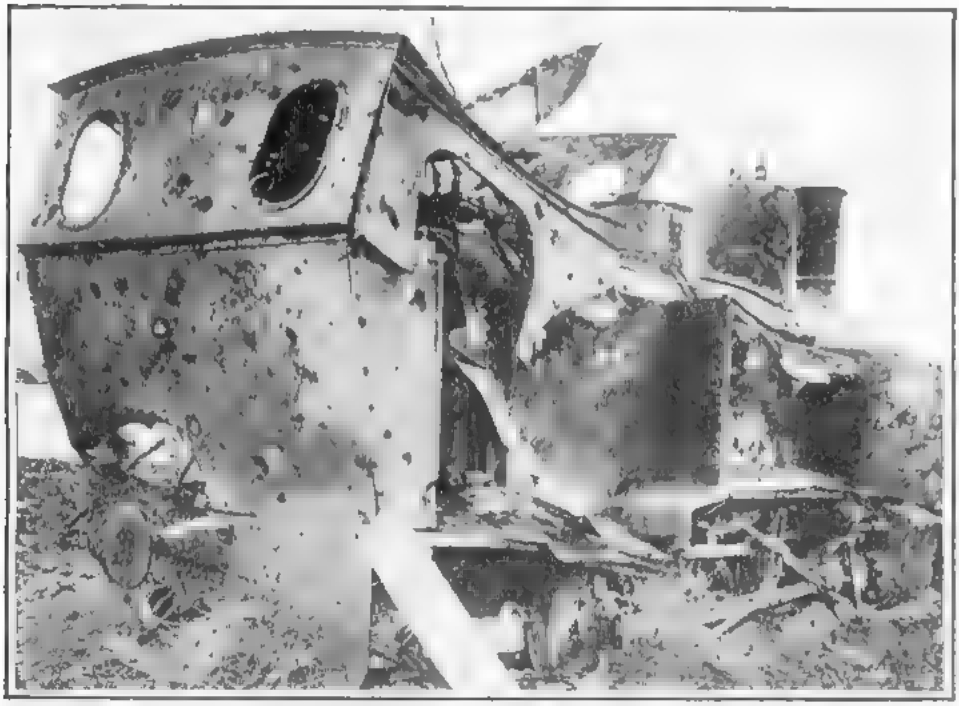
Across the lonely leagues they moan and call,
Flung by untiring crews who coast the night;
While sheltered ones in darkened hut and hall
Dream vaguely of the distant fevered flight.

HOW THE RAILROADS FARE IN BATTLE.



SOME IDEA OF THE JOB AMERICAN RAILROAD ENGINEERS IN EUROPE ARE NOW TACKLING MAY BE HAD BY THIS SCENE OF DESTRUCTION WHICH WAS WROUGHT BY THE RETREATING GERMANS NEAR THE WEST FRONT.

Photo copyrighted by International Film Service



THE HEAVIEST ARMOR PLATE CANNOT WITHSTAND THE TERRIFIC ONSLAUGHT OF GUNFIRE IN THE PRESENT WAR, AS IS SHOWN BY THE CONDITION OF THIS ENGINE WHICH BEARS A FEW SCARS FROM THE BATTLE OF PÉRONNE.

Photo copyrighted by Underwood & Underwood

The Sunny Side of the Track

"NOW, Thomas," said the foreman of the construction gang to a green hand who had just been put on the job, "keep your eyes open. When you see a train coming, throw down your tools and jump off the tracks. Run like blazes!"

"Sure!" said Thomas, and began to swing his pick.

In a few minutes the express came whirling along. Thomas threw down his pick and started up the track ahead of the train as fast as he could. The train overtook him and tossed him into a ditch. Badly shaken up, he was taken to the hospital, where the foreman visited him.

"You blithering idiot!" said the foreman. "Didn't I tell you to take care and get out of the way? Why didn't you run up the side of the hill?"

"Up the soide of the hill, is it, sor?" said Thomas through his bandages on his face. "Up the soide of the hill? By the powers, I cannot bate it on the level, let alone runnin' up hill!"

—*New Ideas.*

A DRUNKEN man threw his arms around a telegraph-pole and then began to feel the pole with his hands. Round and round he went. Finally he gave it up and muttered:

"No use. Walled in!"—*Ladies' Home Journal.*

COUNTRY Lady: "I've been expecting a packet of medicine by post for a week, and haven't received it yet."

Post-Office Clerk: "Yes, madam. Kindly fill in this form, and state the nature of your complaint."

Lady: "Well, if you must know, it's indigestion."—*Tit Bits.*

AT the end of the run, the baggage man went into the washroom and busied himself with soap and water, scouring off the dust and grime. At the basin beside him toiled with similar intent a Pullman porter, and a blacker specimen never took a tip.

The baggage-smasher wound up his ablutions, dried his hands and face on a paper towel, ran a pocket-comb through his hair, smiled at himself in the glass, and then remarked:

"Well, that certainly does make a fellow feel better. Nothing like washing up and feeling fresh and clean after a day's work, is there?"

The porter threw down his own towel and replied

"Dat's right, boss."

And just then he caught sight of his own face in the mirror.

"Dat's right," he continued. "It suttinly is fine to feel cleaner, but somehow Ah never seems to look no cleaner."—*The Argonaut.*

IT was on a local train. The ancient engine, having wheezed laboriously over equally ancient rails, jolted to a restful stop at no place in particular

Time passed tediously; some of the passengers looked anxiously out of the windows, while others drew their hats down over their eyes and tried to forget it. When half an hour had elapsed the conductor came along.

"Hi, conductor!" said a querulous old man. "What's the trouble?"

"We're taking in water," was the explanation.

"Well, why on earth don't you get another teaspoon?"—*Chicago News.*

IN the stilly watches of the night, the traveler lay awake in the Pullman sleeper and listened to the finest demonstration of plain and fancy snoring that it had ever been his fate to hear.

It was no straight ahead affair, robust, monotonous, but instead was full of sudden and awful variations. Sometimes strangulation seemed imminent, then in the middle of a fantasia, the agony stopped suddenly, and there was silence. From far away down the aisle the traveler heard a voice exclaim:

"Thank goodness, he's dead!"—*Manila Times.*

I GOT on a slow train. I told the conductor about the slowness of the train, and he told me if I didn't like it, I had better get out and walk. I said.

"I would, but my folks don't expect me until the train gets there."

In the seat right in front of me sat a mother with her fat boy. She handed the conductor a half-fare ticket and the conductor said:

"That boy is too large to ride on a half fare ticket."

"Well," said the mother, "he wasn't when he got on."—*The Maize.*

THE little son of a clergyman recently appeared at breakfast with distinct evidence of a hastily made toilet.

"Why, Edmund," his mother remonstrated, "I believe you forgot to brush your hair!"

"I was in such a hurry to get to school," he explained

"I hope you didn't forget to say your prayers?" she asked anxiously

"No, siree!" was the emphatic assurance. "That's one thing I never forget. Safety first."

—*Exchange.*

MIKE: "I did an extraordinary thing to-day. I had the last word with a woman."

Ike: "That so? How'd it occur?"

Mike: "Coming home on the car I said, 'Won't you have my seat, madam?'"—*Siren.*

THE workman was busily employed by the right-of-way, and the wayfarer paused to inquire:

"What are you digging for?"

The workman looked up

"Money," he said

"Money? And when do you expect to strike it?"

"On Saturday!" replied the other, and resumed operations.—*Express Gazette.*

A COLORED man entered a telegraph-office and asked the rate to Indianapolis, which the clerk informed him was thirty cents. The negro studied a while, then reached down in his pocket, dug up two dimes and said:

"Just give me twenty cents' worth, please"

—*Telegraph and Telephone Review.*

THE Man Who Names Pullman Cars sprang at the Man Who Names Collars.

"Wshdgcbvfthgdf," he hissed.

"Gbcevdfrcujk," was the withering reply.

"Come, come, boys," expostulated the gentle-voiced keeper, "you were not to talk shop, you know."—*Puck.*

"THERE is a girl who went wrong."

"You don't say."

"Yes, she alighted from a street-car backward."

—*Minnehaha.*

"SAY, Herman, what is this lantern here for?"

"So that nobody falls over the pile of stones."

"What are the stones here for?"

"So that the lantern won't fall over."

—*Meggendorfer Blatter* (Munich).

"WHAT is the secret of success?" asked the Sphinx of a company of railroad attaches.

"Energy," said the coal in the firebox.

"Be first," said the pilot on the engine.

"Keep yourself under control," said the air-brake.

"Have a good foundation," said the tie of the track

"Connect yourself to big things," said the Gould coupler.

"Prepare the way for your coming," said the whistle.

"Keep on the right track," said the locomotive.

"Look neat," said the Pullman car.

"Be sure you have a clear track," said the headlight.

"Keep a going," said the steam.

"Have a system to your work," said the time-table.

"Despise not the power of small things," said the coupling-pin.

—FREDERICK D. LAMB, in *Erie Railroad Magazine*

"I HEAR you came back over a scenic route?"

"Er—yes. So I did."

"I presume you enjoyed the trip?"

"Immensely. We got up a game of cards that lasted the whole day, and my luck was amazing."

—*Exchange.*

RAILROAD Attorney: "You want damages—what! Why there isn't a scratch on you!"

Van Hardupp: "But think of the mental shock and depression of not finding a scratch on me after such a wreck.—*Port Jervis Gazette*

THE victim of the accident glanced thoughtfully at the caller's card.

"I guess you're what they call an ambulance-chaser, ain't you?" demanded the injured one.

"That's rather a harsh name, old man," replied the lawyer blandly. "Why not call me a settlement worker?"—*Berkeley Weekly.*

A FRUGAL Scot, wishing to light up, asked a number of fellow passengers for a match. None of them having one, Sandy said resignedly:

"Aweel, I'll have to use yin o' ma ain"

—*Boston Transcript.*

ONE day after the brakeman had been explaining the scenery one of the passengers whispered to the conductor:

"Conductor, can you tell me how that brakeman lost his finger? He seems to be a nice fellow."

"That's just it, ma'am. He's so obliging that he just wore his finger off pointing out the scenery along the line."—*New York Globe*

"MY mother-in-law must catch that train, driver; so hurry up."

"You can count on me, sir. I shall drive as if she were my own."—*Boston Transcript.*

SEEING a tramp hurrying away from a large house, a fellow professional asked him what luck he had had.

"It ain't no use askin' there," was the reply. "I just had a peep through the window. It's a poverty-stricken house. There was actually two ladies playin' on the one pianner."—*Exchange.*

THE PICNIC-TRAIN.

BY LYDIA M. DUNHAM O'NEIL.

BACK to the green alfalfa-patch and the ripening golden grain!
For I've just come in from a ten-hour trip on a . . . (censored) picnic-train!

There were ninety kids of either sex, with skipping-ropes and balls
And bats and dolls and ninety kinds of pouts and scowls and squalls;
And fifty mas and several pas and cousins and aunts and friends,
And boxes, baskets, parasols, and shawls and odds and ends.
Some had a grouch and some a grin and some a face of pain,
And all resolved to take it out on the crew of the picnic-train.

The con, he hollered "All aboard!"—I rounded up the brats
In sassy, snub-nosed yellow shoes and melancholy hats,
And sport-shirts, with embroidered sleeves, and sloppy, slouchy middy—
I shooed them, chased them, caught them, piled them, till my brain grew giddy.
And then I helped the ladies on and hollered "'Board!" again,
And we were off for a terrible trip on a . . . (censored) picnic-train.

A hamper stood out in the aisle, filled up with toothsome lunch;
The con, he failed to see it, being busy with his punch,
He tripped right over it and skinned his Most Official Shin;
He ripped a yard of language loose that listened like a sin.
The ladies looked askance at him, the little girls were shocked;
The boys, they giggled ghoulishly and winked and mouthed and mocked.

The hamper split beneath his weight—there was an awful hush;
The pickles scampered down the aisle, the peaches murmured "squish!"
An olive wiggled down his neck, a bean crawled in his nose;
Some mayonnaise soaked through his socks and trickled down his toes;
A sardine to his mustache clung, some orange marmalade
Spread stickily upon his clothes—an awful mess it made.

And when I'd got the con cleaned up, presentable again,
There came a fearful female shriek—"Conductor, stop the train!
Poor Teddy from the window fell!"—she clamored in despair;
We backed the train for half a mile and found—a teddy bear!
She asked four dollars' damages because one eye was gone;
We told her nix, she threw a fit—but the picnic-train went on.

And then a thermos bottle quietly began to leak;
To clean the grape-juice from that plush will occupy a week.
And all the aisles and vestibules were strewn with peanut shells
And crackerjack, and all the cars were loud with savage yells.
And chewing-gum stuck fast upon the window-panes like glue,
And sandwiches were sat upon by that unholy crew.

The lick'rish candy trickled 'round like black tobacco-juice,
And in the tea and coffee bottles half the corks got loose,
Banana pulp and skins of grapes upon the door-knobs clung,
And out of all the windows picnic-frenzied children hung,
And just to spite the company they tried to break their necks,
And it was worse than going through a hundred thousand wrecks!

When Nathan Hale cashed in his checks the eagle screamed a knell,
And Freedom shrieked, the folks do say, when Kosciusko fell;
But the very angels wrung their hands and uttered cries of pain
When the callboy signed me for a trip on that . . . (censored) picnic-train!

BIG RAILROADING—2.

(Second Series.)

"TRAFFIC, TERMINALS, AND TINKERS"—EFFICIENCY IS THE KEY-NOTE ON THE ROAD, IN THE SHOPS, AND IN THE YARDS.

IF ONE CAR COULD HAVE COVERED ALL THE MILEAGE ROLLED UP BY THE NEW YORK CENTRAL'S FREIGHT EQUIPMENT IN A TWELVEMONTH, "THAT CAR COULD HAVE MADE EIGHT ROUND TRIPS BETWEEN THE SUN AND THE PLANET THE KAISER WANTS TO OWN"—WONDERS OF TRAIN-RESISTANCE COMPUTER, ELECTRIC WELDING, AND WAY-BILL COMPTOMETERS—CAN SUCH MACHINES AS THESE THINK?

BY CHARLES FREDERICK CARTER,

Author of "When Railroads Were New."

NEW YORK has the largest population of any State in the Union, most of which is reduced to the humiliating necessity of earning an honest living. It follows, then, that the Empire State is one great hive of intensified industry which, of course, is productive of traffic; and traffic, you must know, is what keeps the railroads busy, particularly the freight-claim department.

Handled Over 100,000,000 Tons a Year.

Because it pierces the hearts of all the most prolific traffic-producing points in the State, the New York Central has grown great. For, notwithstanding its 5,688 miles of main line, extending into eight States and the Dominion of Canada, over which it transports a generous proportion of long-haul freight, the average haul per ton for the 106,607,668 tons handled in 1916 was only two hundred miles, which is barely two-thirds of the distance across the State of New York from Albany to Buffalo.

Another point worth noting is that an unusually large proportion of the Central's traffic is high-toned, no less than 27.3 per cent being products of manufacture. Only 16.22 per cent of the Pennsylvania's freight traffic was products of manufacture in 1916, which is about the average for all the railroads.

Short hauls and manufactured products require that the railroad possessing them should run largely to terminals. For every mile of main line in New York State the New York Central has a little more than two miles of sidings; although the ratio for the entire system is a trifle less than a mile of siding for each mile of main line.

Could you have the privilege of riding a "pony"—which is vernacular for a small locomotive, the cab of which is extended forward to the smoke-stack, forming a passable imitation of a car with chairs

lined up single file on each side of the boiler, a conveyance originated on this railroad for the convenience of officials on inspection trips — you might gain a better understanding than you ever had before of all that is comprehended in the word "terminals," and of the immensity of big railroading.

City Only Keeps the Tracks Apart.

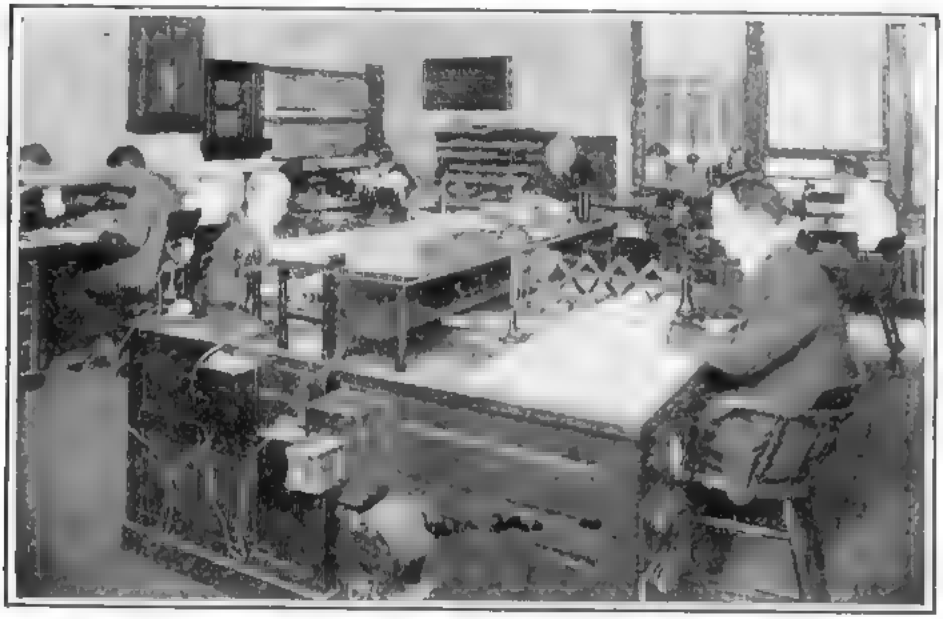
Such a journey would be likely to leave the impression that Buffalo is simply a vast railroad terminal, the city itself being mere incidental filling to keep the tracks apart.

Any such exuberance of fancy would be quite pardonable; for, in good truth, the Buffalo terminals of the New York Central constitute grand international headquarters for big railroading. If you do not believe it, be so good as to cast your eye over the paralyzing statistics hereinafter set forth.

Suppose we begin afar off to round up the stragglers on the outskirts of this herd of figures and work up to the corral by degrees.

As a warming-up center to familiarize you with big numbers, so you will not shy at what follows, take from the annual report for 1916 the single item of freight-car mileage. During the year freight-cars traveled, while earning money on the New York Central system — not including "non-revenue" and "special" car-miles, remember—1,513,594,055 miles.

If all this traveling could have been done by one car, and done in the right direction, that car could have made eight round trips between the sun and the planet the Kaiser wants to own, and be more than a fourth of the distance back on the ninth outward-bound trip.



KEEPING TABS ON TRAINS RUNNING OVER MORE THAN 6,000 MILES OF TRACKS AND CARRYING 100,000,000 TONS OF FREIGHT A YEAR SEEMS AN IMPOSSIBLE JOB. YET THE TRAIN DESPATCHER'S OFFICE HANDLES THE WORK WITH EFFICIENCY, ACCURACY AND A SINGULAR CALM

Now let's get down to cases.

The territory between Syracuse and Buffalo and Niagara Falls is separated into two operating divisions which, together, comprise 1,200 miles of main track (not line, remember) and 850 miles of sidings, a total of 2,050 miles of track connected by 5,824 turnouts

The Syracuse division embraces everything between that city and Buffalo, which are 149 miles apart. Two hundred freight-train crews are required to keep traffic

moving over this division—a small number, considering the volume of business.

But you ought to see the trains they run! Why, when the locomotive of a freight-train passes, you will have time to go up-town for lunch, linger to swap repartee with the cashier if she's pretty, saunter back to the station, and by the time you have found a shady wall to lean against, the dog-house will be just sailing by.

And they roll 'em along at a good clip, too. You cannot pick posies along the way while riding a freight-train here; for the New York Central is on the level. A billiard-table has nothing on this railroad.

Ordinarily these big, fast freights never stop between Syracuse and Buffalo, for one tank of coal is plenty, thank you, and water is taken from track-tanks.

But the Syracuse Division's claim to immortality is based, not so much on the interminable trains forever trundling over it, as upon the fact that it has had the enterprise to originate a variation upon that sacred legend of the railroad, the Moon Story.

New Twist to the Moon Story.

Part of the way the Erie Canal parallels the tracks; the canal-boats wear headlights. So, instead of taking the passing-track to let the moon go by, or going back to flag the moon or whistling down the moon, or whatever your pet version provides, you are here told how Paddy Flatwheel, ever alert and faithful, hustled back to flag a canal-boat.

Buffalo terminal territory, embracing an area of three hundred miles, roughly speaking, is a division all by itself. The division can boast of only 69 miles of main line; but to compensate for this meager allowance there are seven important yards, with a total of 150 miles of track, not to mention a lot of industrial tracks, the whole connected by 3,300 switches.

Always there are from 13,000 to 18,000 cars on the division. If coupled together, these would make a continuous line from 98 to 135 miles long.

Each day there passes over the division an average of 12,000 cars. Adding a modest allowance of cabooses and locomotives, to make them up into trains would stretch these out into a continuous belt about 96 miles long, which would have to move steadily at a speed of four miles an hour to pass a given point over a single track in one direction in twenty-four hours.

12,000 Cars a Day on This Division.

However, freight does not constitute the only business. Eight switch-engines and 24 yard-crews are required to handle the 240 passenger-trains that arrive and depart from Exchange Street Station daily; for switchmen now have the eight-hour day.

The engines also work on the eight-hour system—eight hours three times a day. Also, there are six to eight solid express-trains to be passed over the division daily, not to mention from 100 to 105 cars of express matter to be worked at Exchange Street Station.

While on the subject of passenger-trains, perhaps you may like to see Patsy White come in. Patsy White is a local passenger-train running daily between Rochester and Buffalo, so-called in memory of an engineer who pulled the train for so many years that it came to be regarded as his own private property.

Patsy is dead now, but his name lives on, a survival of a custom, now obsolete, of naming trains after the men who ran them. Usually it was the conductor who was so honored.

The exception in Patsy's case indicates that his personal popularity was overshadowing. It must have been, because he was once a candidate for Congress.

Another indication is found in his escape from the usual style of sobriquets by which his colleagues were known.

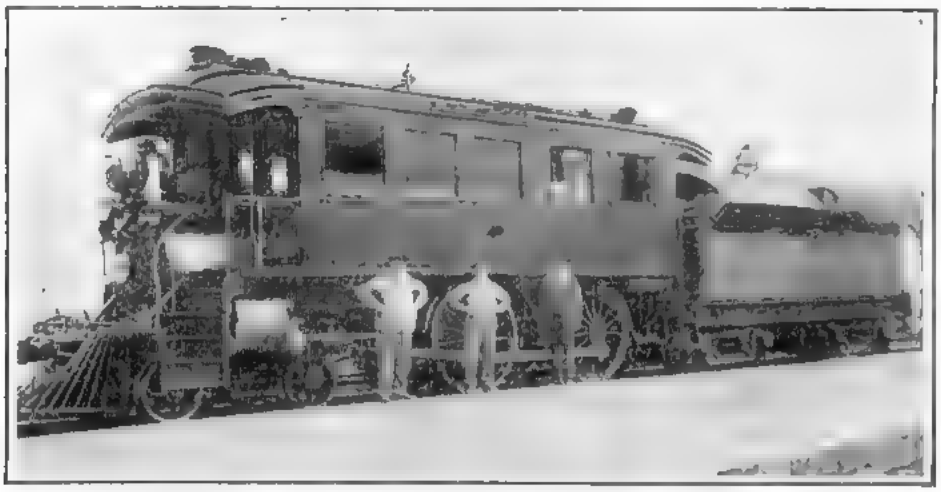
Nefarious Nick-Names, These!

One went by the name of Feather-Nose, for instance, although he did not have feathers on that feature, but merely hair. Tapeworm had an appetite that was worth going miles to see.

Among those present were Silent Mike, who was never known to be in that condition; Diamond Henry, Red Oil, Flying Dutchman, Plum Pudding, False Face,

Sleepy Bob, Rubber Nose, Mag Murphy, Rotten Liner, Pig-Tamer, and Pickles.

One of the yardmasters at Buffalo is known as "Polly," because he is alleged to hold the blue ribbon for long-distance, non-stop conversation. Other yardmasters here are "Milk-Can," "Lead-Foot," "Spot," and "Frosty," whose whiskers have grown gray in the service of the company.



A CROSS BETWEEN A LOCOMOTIVE AND AN IRISH JAUNTING-CAR. THIS TYPE OF "PONY" IS USED COMMONLY FOR INSPECTION PURPOSES.

The fecund railroad fancy is no less apt at coining names for inanimate things. A "Jigger" is a train of low-class freight, like coal and lumber. The Mud Run is a through express-train for the West. Any old milk-train is a Tin-Can Special.

A certain Ontario Division passenger-train is known as the Hojack, notwithstanding official displeasure, perhaps because the superintendent who forbade the further use of this familiarity was afterward overheard to use the *verboten* term himself.

Tonawanda's Great Lumber Market.

Freight-yard work on the Buffalo Division keeps one hundred engines and three hundred yard-crews busy. The division extends for thirty-three miles along Lake Erie and the Niagara River, and it is packed with big industries for the whole distance.

Just to give an idea, the various industries at Niagara Falls furnish two hundred cars of freight a day. Half-way between the Falls and Buffalo is Tonawanda, one of the largest lumber markets in the country, with a daily traffic of 225 cars.

Near by is a chemical plant that furnishes 75 cars of freight a day, and steel-works that require 33 cars of coke and limestone daily, not to mention the finished products shipped. There are a number of other industries grouped in the vicinity, attracted by cheap power and transportation.

Between Tonawanda and Buffalo is Black Rock, another great industrial center, furnishing hundreds of cars of freight daily. Black Rock freight-station alone does a business of a hundred cars a day, while the interchange with other railroads amounts to 400 cars daily.

At Niagara Falls the interchange with the Michigan Central alone amounts to 2,000 cars daily; and then there is the business with the Grand Trunk, Pere Marquette, and Wabash.

East Buffalo is another important interchange point, the total running up to half a million cars a year.

Of the numerous freight-stations in Buffalo, the one at Ohio Street is the most important. In the warehouse, which is 2,200 feet long and from 140 to 185 feet wide, the force of 500 truckers and tally-

men have been known to handle a thousand tons of freight in an hour.

Four steamers can be worked at one time, while as high as 217 cars have been unloaded and 197 loaded in a day. In 1916, 635 steamers docked at the Ohio Street freight-house, and 127,000 cars of freight were handled.

More spectacular than any other single feature of big railroading to be found on the Buffalo Division is the Concrete-Central Elevator, about two miles south of the Ohio Street freight-station.

The Concrete-Central Elevator set out in 1915 to be a modest affair with a storage capacity of 2,000,000 bushels; but its success was so prompt and so pronounced that the management immediately set to work to enlarge it to a storage capacity of 4,500,000 bushels of grain, making it by far the largest thing of the kind in the world.

Elevator's Nominal Capacity Is Actual.

Its actual is equal to its nominal capacity, owing to its division into a large number of small bins ranging from 4,000 to 25,000 bushels in size, so that lots of any kind or grade or quantity may be stored up to the capacity of the plant.

Some elevators have a few very large bins. If each is partly full, it may not be possible to take any more, although the plant may not be filled to anywhere near capacity.

The Concrete-Central Elevator has water on three sides and the New York Central on the fourth side. It is 1,400 feet long, and has an extreme height of 200 feet, although the bins are only 95 feet high. On one water-front three marine towers 165 feet high can be used to unload three vessels at the same time, or all can be concentrated on one; while still another tower at one end can unload a fourth vessel, making the total unloading-capacity 100,000 bushels an hour.

On the land side the New York Central has laid out a grain-yard which will hold 1,200 cars while they are being inspected, cleaned, and coopered. The grain trade is most exacting, for it requires a perfect car, free from odors, oil, resin, tar, or other sticky stuff, and the floor must not be stained.

After a car has passed the inspector's critical eye it must be "coopered," which is the trade term for putting boards in the doorway to hold the grain. This is a job that must be carefully done; otherwise the car will distribute its lading along the road and arrive at its destination empty.

Flaxseed is a particularly troublesome thing to handle, for it is so oily and elusive that a whole car-load will wriggle out of a crack that a mosquito could not stick his bill through. For flaxseed a car must be coopered with extra care, then lined with cheesecloth.

Coopering cars may seem a trifling matter to the casual observer, but the railroad company does not find it so. Last year the New York Central used 7,000,000 feet of lumber for coopering grain-cars at an average cost for material and labor of $3.68 per car.

Load 70 Wheat-Cars an Hour.

There are five loading-tracks beside the elevator with a capacity of twenty cars at once. Cars are loaded at the rate of 70 an hour, or, say, 84,000 bushels of wheat.

The admiration-compelling feature of the grain-yard is the way it is laid out. Two loops make the entire circuit of the yard, so that once a car enters it never reverses its direction, but keeps moving straight ahead from the time it enters the yard until it has been loaded and shoved out again into a receiving-yard, where a road-engine can be coupled on and the train started for the seaboard without going through the congested part of Buffalo.

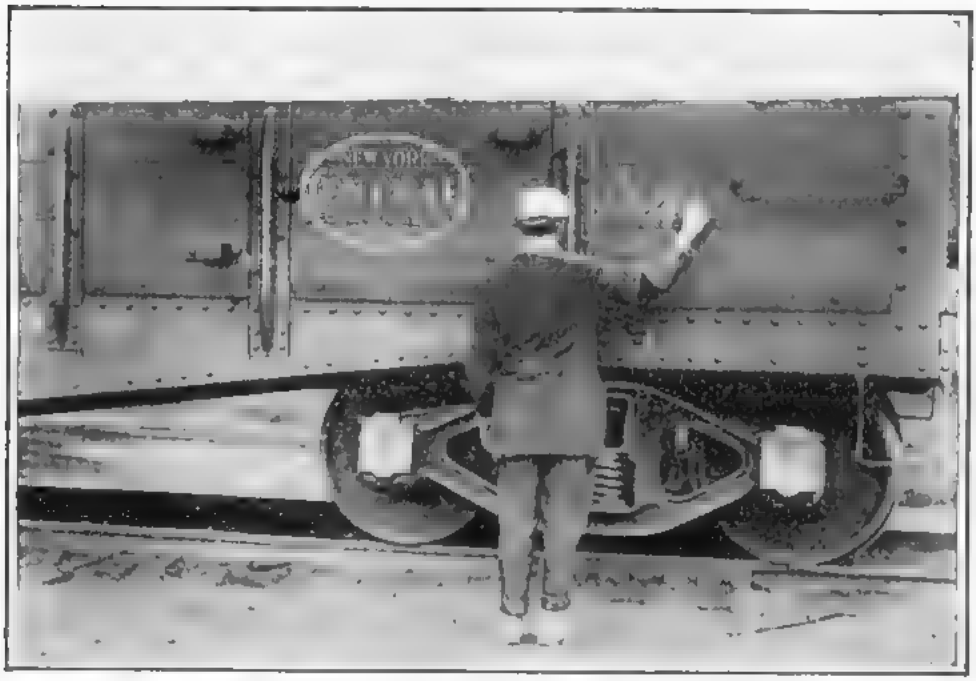
This one elevator can furnish almost a solid train an hour; and there are sixteen other grain-elevators at Buffalo from which the New York Central gets its share of traffic. In fact, this one road hauls half the grain out of Buffalo, although there are several other lines willing to help.

A couple of miles south of this mammoth elevator, on the main line to the west, are the West Seneca yards, from which a group of steel-mills are served, and where meat and dairy trains are reiced at the rate of a car in four minutes.

Here connection is made with a cut-off by which some limited trains and all through freights cut across lots to avoid going through Buffalo, regaining the main line at Depew, about ten miles east of Exchange Street Station.

Midway of this cut-off is the Gardenville yard, now only half completed, which will be larger when finished than any other will not have to be amputated in order to get into clear.

Buffalo is too vast, too much spread out, to afford a satisfactory view of terminal railroading. Besides, in all the yards but at Gardenville, tail-switching is the only method available; and that looks too much like work for any but the most callous of spectators to watch with equanimity.



WAY-BILLS FOR THROUGH FREIGHT ARE SENT UNDER COVER BY TRAIN MAIL, THE CONDUCTOR RECEIVING ONLY HIS RUNNING SLIPS, AND THE DESTINATION IS CHALKED ON EACH TRAIN, THUS SAVING RED TAPE

now in existence. It occupies a plot 3.7 miles long and half a mile wide, on which some 70 miles of track have been laid, while the program for 1917 provides for laying an additional 25 miles.

Yard Will Hold 21,400 Cars.

Ultimately the yard will have a capacity of 21,400 cars and 266 locomotives.

Building a yard piecemeal has its disadvantages, because locomotive capacity and, as a consequence, the length of trains keeps increasing so rapidly that just about the time a section of yard is completed the overworked engineers have to figure the whole thing out again to provide for longer tracks in the receiving-yards, so that trains

For a close-up picture of high-art yard-work, it is necessary to go to De Witt Yard, at Syracuse. If any man thinks De Witt Yard is not the best arranged, best managed division freight-terminal on earth, it is up to him to produce something that can beat it.

A division terminal is not a place where cars are put away in mothballs, but to keep them moving. That is what is done at De Witt. A series of receiving, classification, and advance yards for both east and west-bound cars is so closely dovetailed together that no mere outsider could tell where one ended and another began.

Together, they extend four and a half miles east and west, in which area are 170

miles of tracks and the only double hump in captivity; one for east-bound, the other for west-bound classification. They stand side by side, right in front of the general yardmaster's office.

Between the two runs a track over which solid, fast through trains are passed along after hesitating just long enough to change engines and train-crews.

45 Switchers Kept Busy.

Forty-five yard engines and a force of conductors, brakemen, and switch-tenders varying from 246 to 275, according to season and volume of traffic, are required to keep things moving. Tom Leonard, a veteran who for years was traveling yardmaster, a consulting specialist who roamed about the system correcting unsatisfactory conditions and making good yards better, is in command.

There are 45 telephones peppered over the yards, so that the whole force is always in instant touch with the office.

The west-bound yard has 11 receiving, 23 classification, and 11 advance tracks; the east-bound 14 receiving, 23 classification, and 16 advance tracks.

The big yard works like a well-oiled machine. A train, on arriving, pulls in on a receiving-track, which is long enough to hold the longest train that runs over its division.

Here road-engine and caboose are cut off; then a couple of switch-engines get behind it and boost it over the hump at a steady gait that keeps a constant stream of cars flowing down the 4½-per-cent grade on the other side of the hump, and so on down the ladder-track to one of the classification-tracks, each of which is also long enough to hold a full train.

At the crest of the hump stands a man with a switch-list who chalks on the end of each car the number of the classification-track for which it is destined, while a pin-puller with a duplicate of the switch-list cuts 'em off.

Meanwhile a rider has climbed aboard, and, seating himself comfortably on the end of the running-board, with his feet hanging over, he inserts his club in the brake-wheel and personally conducts that cut to its place on the classification-track. When the automatic couplers have done their duty, the rider steps across the yard to where a gasoline car that plies ceaselessly to and fro returns him to the hump.

As far as possible, trains are made up solid for single destinations, as Cleveland, Toledo, Elkhart, and so on, so that it is never necessary for the road-crew to pull a pin or make a switch, nor for the next division force to do anything more than change engines and cabooses, inspect the trains, and pass 'em along.

Other trains are made up in station order, so that all cars for a single destination can be set out at a single switch. This avoids delay to the train, and also avoids balling up the road doing rawhiding that can be much better done at De Witt.

Seven classifications for New York City are made at De Witt, thus avoiding switching at Seventy-Second Street, where there isn't room to do it.

When a classification-track is full a switch-engine pushes it out into the advance yard, where air brake inspectors give it the once-over, couple up the hose, hitch on an engine, and try the air. Meanwhile the train-crew has been called, the conductor has received his running slips—way-bills for through freight are sent under cover by train-mail—checked up his train, and reported to the yardmaster that he is ready to go, whereupon the yardmaster telephones to the towerman, who lines 'em up—and then they're off.

Despatches a Train Every 16 Minutes.

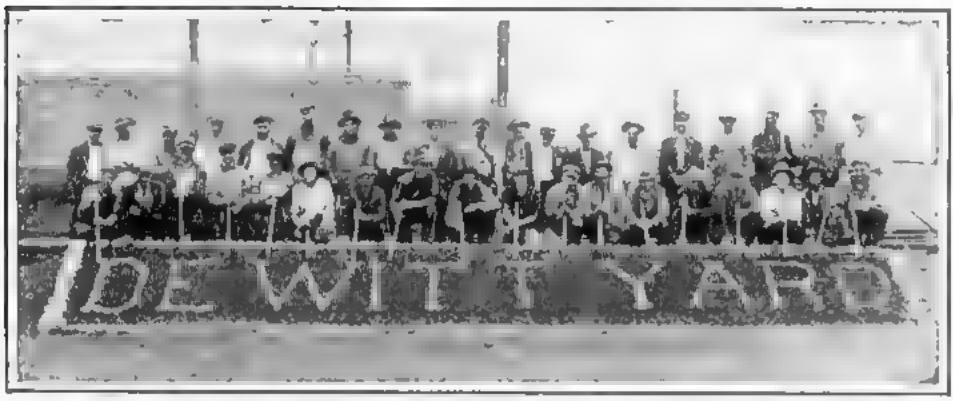
A fair average gait for De Witt Yard is to despatch at the rate of a train for each 16 minutes of the 24 hours. In terms of cars this means, for example, 11,052 on May 22, 1917, and 12,474 cars on May 21, 1916. In the calendar year 1916 3,725,066 cars were passed through the yard.

In these days the engineer hasn't a word to say about the number of cars his engine shall haul. The superintendent does that in schedules designating train loading for various classes of engines according to weather and other conditions.

All cars are not alike; so in order that

each engine may haul every pound it is capable of pulling, yet not be overloaded, each train is "weighed," not on scales, but by a clerk in the advance yard office, with a Standard Train-Resistance Computer.

There are eleven different schedules for each of three classes of engines, Mikados with 56-inch drivers and 48,550 pounds tractive power being assigned to Jiggers, a type of Pacifics with smaller drivers and much greater tractive power than the passenger Pacifics being assigned to fast freight, while Mohawks, a type of locomotive peculiar to the New York Central, with cylinders 28x28 inches, drivers 62 inches in diameter, and 51,400 pounds tractive power, are used on both fast freight and Jiggers.



AT NO TERMINAL CAN YOU GET A BETTER IDEA OF WHAT YARD WORK IN BIG RAILROADING MEANS THAN AT THE BUSY DE WITT YARDS, WHERE 170 MILES OF TRACK, PLUS THE ONLY DOUBLE HUMP IN CAPTIVITY, ARE KEPT HUMMING DAY AND NIGHT

Train Resistance Computed by Machine.

For example, Schedule A allots 100 cars, or 5,000 tons, to the big engines, and 80 cars, or 3,400 tons, to the Pacifics. The lowest schedule, for the most unfavorable conditions, is 60 cars, or 2,700 tons, to the big engine and 40 cars, or 1,800 tons, to the Pacifics.

The clerk takes a stack of way-bills from a pigeonhole in a big distributing-rack like that in a postal car and sits down at the computer, of which all that can be seen is a dial a foot in diameter with tons listed around the outer edge like figures on a steam gage and two counters, one for cars, the other for tons.

The center of the dial is a revolving disk, the outer edge of which is full of holes. The clerk sticks a steel pin in a hole in the disk opposite the number on the dial representing the combined weight of car and contents as noted on the way-bill and pulls the disk around to the right as far as it will go. The process is repeated until the car limit or tonnage limit is reached.

The train-resistance computer is not a mere adding-machine, but an adding-machine plus a calculator which automatically makes allowance for the average resistance of a given weight of car. Forty tons is taken as the unit; that is, a car and its load, weighing together 40 tons, is counted in at that figure.

But a 30-ton car must have a ton added for resistance; a 25-ton car adds 2 tons, and a 20-ton car is recorded as 23 tons. Above 40 tons resistance is subtracted, 60 tons being counted as 54, 70 tons as 60, and 85 tons as 68 tons.

Coal-cars are generally overloaded. Ninety cars of coal might make 5,500 tons, which is 500 tons more than called for by Schedule A. So the clerk cuts back to 82 cars, making up the train by tonnage limit, instead of car-limit.

On the other hand, a fast freight-train is nearly always shy on tonnage when the car-limit has been reached. An actual example was a train of 85 cars, the limit under Schedule D, which weighed only 2,798 tons, although the tonnage limit is

DOWN TOWN FREIGHT-HOUSE AT SYRACUSE THE TERRITORY BETWEEN THIS TERMINAL, BUFFALO AND NIAGARA FALLS IS SEPARATED INTO TWO OPERATING DIVISIONS WHICH TOGETHER COMPRISE A TOTAL OF 2,050 MILES OF TRACK YET THE TWO CITIES ARE ONLY 149 MILES APART, WHILE NIAGARA FALLS IS BUFFALO'S NEXT-DOOR NEIGHBOR! QUITE SOME TRAFFIC DENSITY

4,000. A train can be weighed in five minutes

Besides being required to haul full tonnage, locomotives are pooled so as to keep them going as steadily as possible. Except when they are held in the roundhouse for their semimonthly internal bath, locomotives average a lay-over of six and a half hours at De Witt.

Locomotives Made Ready in 30 Minutes.

In times of stress locomotives have had fires cleaned, have been given rations of water, sand, dope, and "Black Jack," and delivered, ready to go in thirty minutes.

Two grades of coal are served on the New York Central — that for freight-engines is know as Black Jack, and is alleged to consist of equal parts of slate and sandstone, whereas the "gold nuggets," provided for pampered passenger-engines, is said to be pure carbon. This analysis is not official, however; it is merely given for what it is worth.

Delays due to engine failures are very rare; for apparently the engineers do not know an engine failure when they see one. Jim Smith was coming east with 100 cars, which was the limit, one day last May, when his engine broke a piston-rod nineteen miles from Syracuse.

Now, if a broken piston-rod isn't an engine failure, what, in your opinion, would constitute an engine failure?

But Jim violated all the rules of the game by keeping 'em a rolling. A little farther along, when he whistled for a crossing, the whistle-valve stuck open and could not be closed again; whereupon Mr. Smith exclaimed, "Excelsior!" or something like that, and continued to wend his way eastward until that herd of box cars was safely within the corral at De Witt.

Hauled Big Drag with Broken Eccentric.

Not long afterward Engineer W. Leffler was proceeding west over the Mohawk Division with 77 cars when, 22 miles east of Syracuse, his engine broke an eccentric-rod. Not realizing that he had an engine failure on hand, Leffler blocked the old mill up so she could limp in on one side with her train with only fifteen minutes' delay.

These untoward trifles call to mind the fact that a railroad terminal is, primarily, a place where engines and cars are cobbled up so they can hobble along to the next terminal.

For railroading is the most destructive industry known to man. Seventeen and a half cents out of every dollar the New York Central earned last year was paid out for maintenance of equipment; in other words, for tinkering up engines and cars.

For every mile run by a locomotive the company had to pay out 7.56 cents for repairs, or $11.27 for each trip over a division of 149 miles. The total cost of repairs to steam locomotives in 1916 was $7,301,296, which was over a million dollars more than the total amount of wages paid to engineers and firemen.

Repairs to freight-cars cost, in 1916, $14,515,690, which was double the amount of wages paid to all trainmen, both freight and passenger. Even this is not the whole story; for cars valued at $1,569,473 were worn out and sent to the boneyard, while the survivors depreciated in value to the tune of $2,904,224.

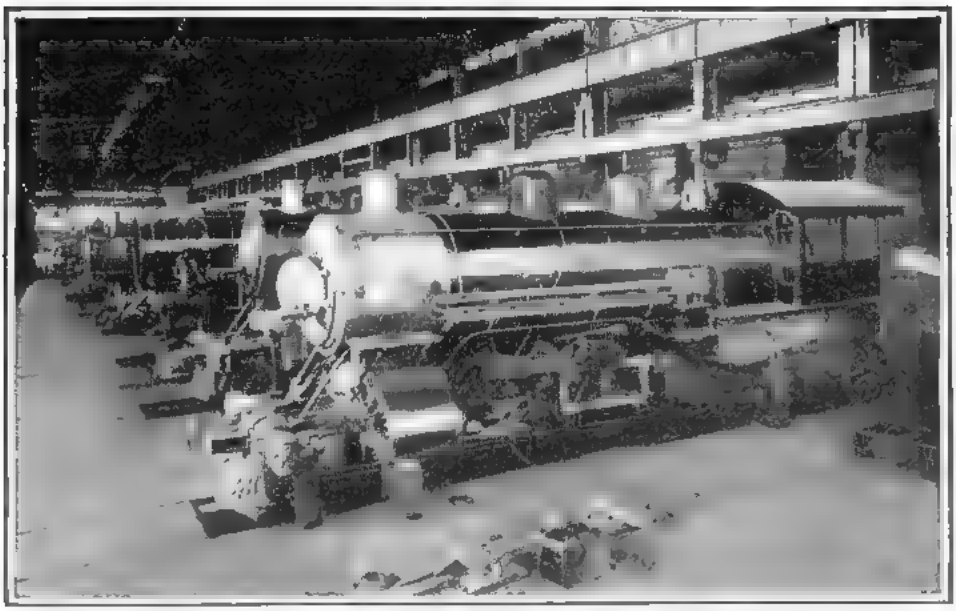
Huge Repair and Depreciation Bills.

Just these three items, added together, wipe out 15 per cent of the freight revenue. When these facts have soaked in, you are in a position to appreciate the importance of well-managed shops. The more efficient a railroad's shops are, the longer it can avoid a receivership.

The New York Central's principal shops are at West Albany. Unlike the operating-department, the shops have no speed-limit. With a force of only 1,073 men, an average of 74 locomotives is given a general shopping per month, besides which all cylinders for the entire system are finished here.

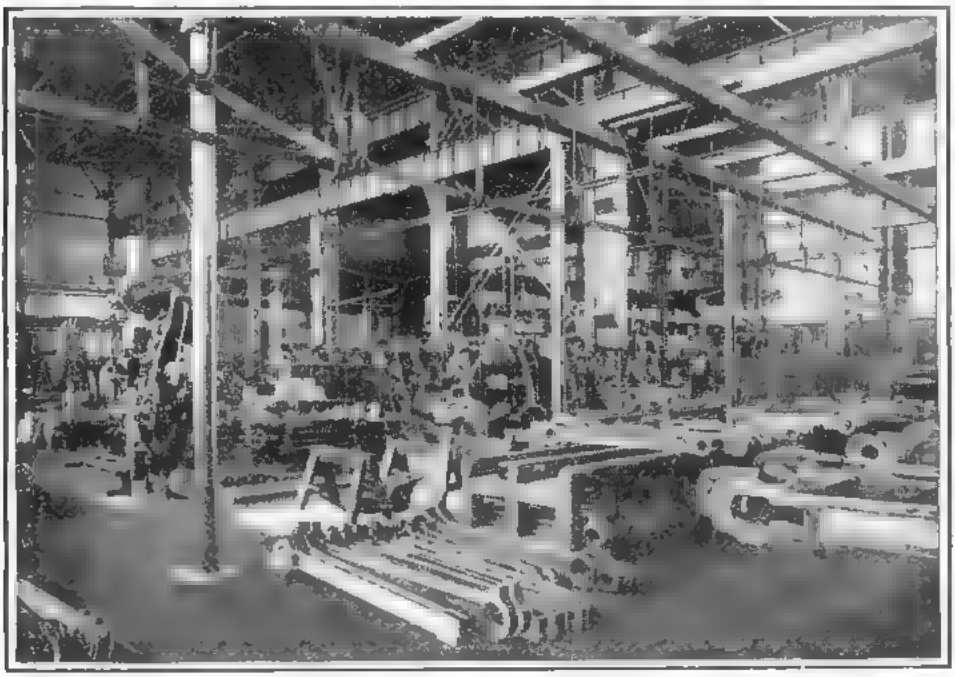
A broken main frame has been repaired at West Albany in 7 hours, although the usual time is three days. Not so long ago the mending of an engine frame was a two weeks' job; for the engine had to be stripped, the frame taken out and sent to the blacksmith-shop and welded, and then the blessed locomotive had to be reassembled and lined up.

Now they never think of stripping an



AT THE GREAT WEST ALBANY (N. Y.) WORKS, WHICH COMPRISE THE CENTRAL'S PRINCIPAL SHOPS, 74 LOCOMOTIVES ARE REPAIRED IN A MONTH, AND ALL CYLINDERS FINISHED.

engine to mend a broken frame. The cripple is simply run into the shop and, perhaps, a pair of wheels dropped out, and then an electric welder is turned loose on it. The electric welder, of whom there are twelve, half working days, the other half nights, does not even have a helper—nothing but a pair of rubber gloves and a helmet with a window of red and green glass.



ANOTHER VIEW OF THE SAME SHOPS. HERE ELECTRIC WELDING IS PRACTISED IN ITS HIGHEST DEVELOPMENT, A BROKEN MAIN FRAME HAVING BEEN REPAIRED IN 7 HOURS.

When an engine broke a cylinder-head in former days the whole casting, which includes the steam-chest and half the saddle, had to be thrown away and a new one substituted at a cost somewhere around $400. Now the electric welder in a few hours, at a cost of $50, glues the broken pieces together so effectively that they will never break again in the same place; for an electric weld is stronger than the surrounding metal.

Electric welding is one of the two most revolutionary shop processes developed in years. Which calls to mind the fact that when Bill Hohenzollern ordered wholesale sabotage on German steamers in American waters, under the delusion that he was thereby rendering them useless, he overlooked the New York Central and the electric welding process.

To be sure, the New York Central has no monopoly of electric welding; but some of the foremost exponents of the art have been developed at the West Albany shops. Their advice and assistance reduced the task of repairing the German steamers taken over by the government to very modest proportions.

Before electric welding was introduced, engine failures were frequent on all railroads on account of leaky flues. At every division terminal every railroad maintained a force of boilermakers who were forever pecking at the flues.

Flue Failures Abolished.

By welding the flues to the back sheet the New York Central has abolished flue failures. Engine No. 3391 ran for more than two years, making a mileage of 192,000 without having her flues removed. Then, their legal age limit having been reached — for the revised statutes very kindly tell the master mechanic how long a set of flues will last — they were, perforce, taken out and found to be as good as new.

Electric welding is of two kinds: resistance and arc. The latter is the process used in mending broken frames, cylinders, welding cracks in fire-boxes, welding mud-rings, applying boiler-patches and new side-sheets, and other little chores like that.

Arc welding makes use of the flame produced by the voltaic arc, which is the hottest thing yet devised by man, its temperature being 7,200 degrees Fahrenheit. To get a line on how hot this is, remember that the melting-point of steel is 2,552 degrees F., and of iridium, hardest of metals, 3,632 F.

If the ends of two pieces of carbon through which a current of electricity is flowing while they are in contact are separated slowly, an arc of brilliant flame is formed, consisting chiefly of carbon vapor. The carbons are consumed by combination with the oxygen of the air and by being turned into a gas by the intense heat.

The Picturesque "Flaming Arc."

The point of greatest heat is the center of the carbon carrying the positive current. An arc may be formed between pieces of metal called electrodes, in the same way as between carbons. Such an arc is called a "flaming arc."

Welding is done by drawing a negative carbon away from the pieces of metal to be welded while the metal is given the hot end, which is the positive pole, you will remember. Also, the current flows from the metal to the carbon, thus preventing the former from being saturated with carbon, which is detrimental. The length of the arc used is from one to four inches, according to the size of the work being welded.

When the surfaces of the broken pieces have been brought to welding heat, wires of metal prepared for the purpose in various sizes are melted in the arc, and the molten stuff fuses into and becomes one with the broken parts, holding them together so firmly that they will never break in the same place again.

At Depew shops, near Buffalo, where they have both electric welders and statisticians, the company saved $15,000 by welding electrically 265 broken frames; $14,000 by welding 60 cracked cylinders, and $1,000 a year in maintenance by welding in 137 sets of flues.

Also, $700 was saved by filling in flat spots on 78 driving-wheel tires, instead of turning them down in a lathe. Altogether,

the electric-welding process saved in this one shop $30,000 in a year.

Shopmen are looking to the time when electric welding will abolish bolts, nuts, lock washers, cotter-pins, and such like, which are very largely responsible for breakages of machinery, and for much wear and tear

Over in the car-shops at West Albany they use the resistance process of electric welding with equal success. This process is based on the fact that a poor conductor of electricity offers so much resistance to the flow of the current that it will heat.

Copper is a good conductor, and steel a comparatively poor one. When steel is placed between the heavy copper conductors of a welder, it becomes heated in attempting to carry the large volume of current.

The ends of two pieces of metal form the point of greatest resistance in an electric circuit, and the abutting ends instantly begin to heat. The hotter the metal becomes the greater the resistance to the flow of current; consequently, as the edges of the abutting ends heat, the current is forced into the adjacent cooler parts. Thus heat is first developed in the interior of the metal, which is welded there as perfectly as at the surface.

JOHN E. McKERRACHER, FREIGHT AGENT AT WEST ALBANY TRANSFER. EVERY TIME HE PREVENTS A PARTLY LOADED CAR LEAVING FOR NEW YORK HE SAVES THE COMPANY $13

The machines for resistance welding in the car-shops "spot-weld" sheets of steel together, instead of riveting them, doing the job far better and in a fraction of the time. Speaking of riveting, the car-shops use electric heaters for heating rivets in building and repairing steel cars and electric drills and riveting-hammers. Compressed air is too costly for every-day use in these progressive times.

But let's get back to the locomotive-shop and see 'em turn driving-tires. Not so very long ago a man who could turn a pair of driving-tires in a day was considered a fine workman. If the lathes at the West Albany shops do not turn a pair of driving-tires in an hour the foreman tears his hair and refuses to be comforted

The old-fashioned tool for turning tires was a ponderous block of steel 2 by 3 inches, 18 inches long. That quantity of steel would make ten such tools as are used to-day.

By this economy the company has played a neat trick on the metal market, for it has bought no tool-steel for two years, and will not need to buy for ten years to come, which is a very comforting thought, considering that tool-steel, which was 75 cents a pound before the war, now costs $4 a pound

Stripping driving-wheel tires, which is done by heating the tires until they expand enough to drop off the wheel-centers,

used to be done in slow time with a gasoline heater. Gasoline costs money, as any automobile owner will tell you with more vigor than such a simple statement requires.

At West Albany they do the trick at nominal cost with a crude-oil heater in 18 minutes from start to finish.

These are samples of the time-saving, cost-reducing methods employed throughout the shops. And once a week the whole staff of foremen and superintendents hold a session with the general superintendent of shops to devise new ways of speeding up and cutting down.

Similar methods are followed in the car-shops, where a force of 1,750 men repair 67,795 freight-cars and 275 passenger-cars a month and find time to build a few steel dining, mail, and baggage-cars while they are resting. For instance, quantities of small copper screws are required for coach-work, costing 30 cents a gross. Now the shop produces a far better and cheaper article of its own by copper-plating steel screws at a cost of 2 cents a gross.

Big Savings in Little Things.

The parcel racks in coaches used to be of brass, which had to be relacquered once a year to keep them looking respectable. Now when a coach comes in, the parcel rack is treated to a coat of brown enamel, which costs much less than relacquering, but which will last till the cows come home.

An average saving of $50 a coach is effected by various refinements in repainting. No more gold leaf is squandered in lettering coaches these days, though probably you have never noticed the omission.

With all possible economies, it cost the company, in 1916, $2,217,330 to repair its 3,017 passenger-train cars, an average of $734 each, to which must be added $619,743 for depreciation and $245,392 for cars worn out. Every passenger-train has to have a complete overhauling at least once in twenty months; dining-cars once a year.

It costs $5,000 to overhaul a diner. Every part is carefully gone over, each teaspoon and other silver article being replated and burnished piece by piece with a steel hand-tool.

At West Albany Transfer, Freight-Agent John E. McKerracher does a little in the economy line himself. Every time he prevents a partly loaded car from going from Albany to New York City he saves the company $13.

So at West Albany Transfer, which consists of two freight-houses that have seen better days, with loading-platforms a thousand feet long on both sides of each and 17 tracks holding 400 cars L.c.l., shipments are collected and consolidated in solid through cars that are all loaded to their cubic or tonnage capacity.

That is to say, light stuff, like soda-crackers, are crammed in until you could not insert another cracker with a shoe-horn; while heavy articles, like steel castings, are piled aboard until the cargo crowds the tonnage dead-line, or, maybe, hangs over a mite. Full trains of full cars is the motto on the New York Central.

Clerk Turns Out 700 Way-Bills a Day.

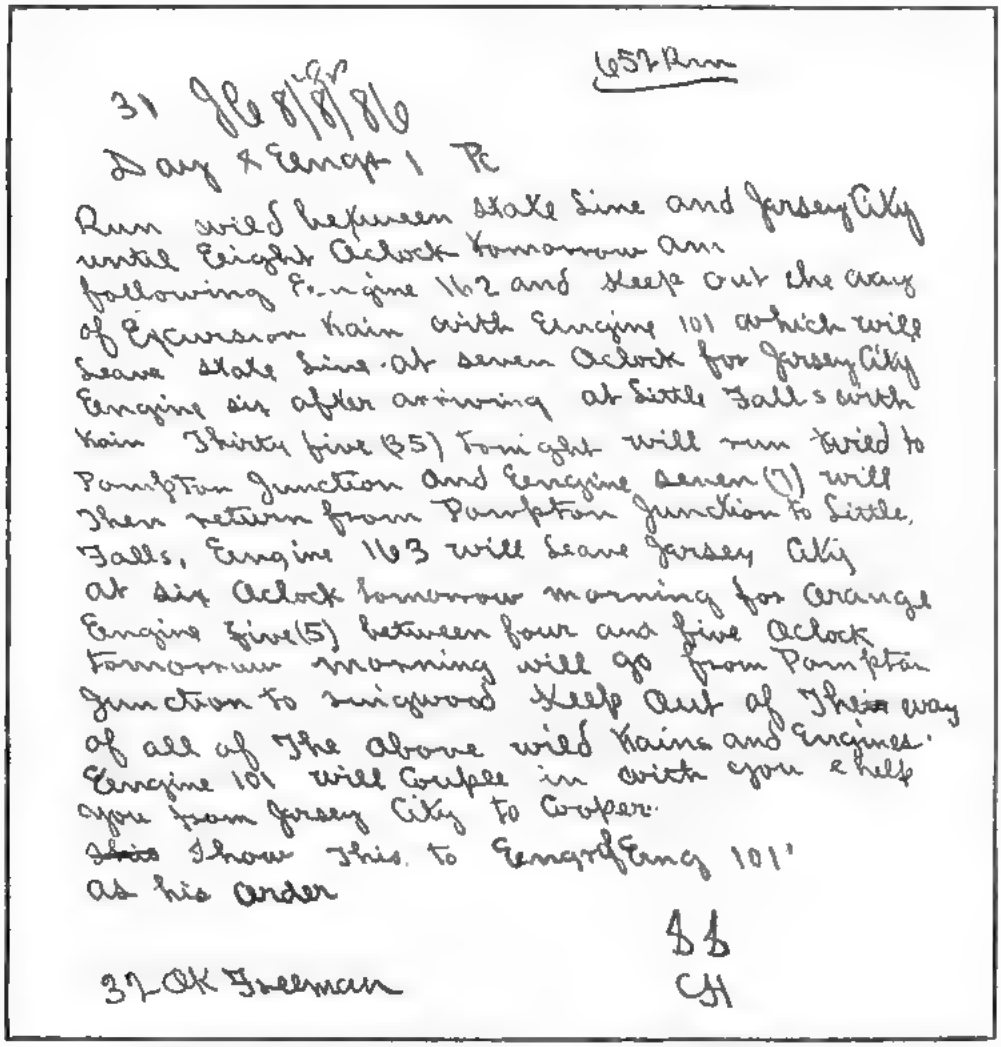
In the month of April, 1916, 7,845 cars were loaded at West Albany Transfer by a force of 174 truckers, loaders, and tally-men. Everything is done by piece-work in the interests of efficiency, including the billing.

This, with a system of daily bulletins showing the daily performance of each billing-clerk, with percentages of errors, has wrought a miracle in speeding up the work. You would not believe the things those billing-clerks, both men and women, do. I do not believe it myself; and I saw them do it.

Formerly a force of 15 billing-clerks were required; now 8 do more work. On some roads a girl who can turn out 200 way-bills a day is thought good; the West Albany girls turn out 700 a day.

And the girls with the comptometers who foot up the freight-charges! No picking out a tune with one finger here. The comptometer operator shuffles the way-bills with her left hand, while with the right she makes a pass at the machine. There is a flash of pink fingers as she snatches a whole handful of keys out of the poor machine, which gives one agonized clatter—and all is over!

A RECORD-BREAKER IN TRAIN-ORDERS.


31 Jly 8/8/86
Day & Engt 1 Pr

1652 Run

Run wild between State Line and Jersey City
until Eight Oclock tomorrow Am
following Engine 162 and keep out the way
of Excursion train with Engine 101 which will
leave State Line at seven Oclock for Jersey City
Engine six after arriving at Little Falls with
train Thirty five (35) Tonight will run wild to
Pamptan Junction and Engine Seven (7) will
then return from Pamptan Junction to Little
Falls, Engine 163 will leave Jersey City
at six Oclock tomorrow morning for Orange
Engine five (5) between four and five Oclock
Tomorrow morning will go from Pamptan
Junction to Ringwood Keep Out of This way
of all of the above wild trains and Engines.
Engine 101 will Couple in with you & help
you from Jersey City to Cooper.
~~This~~ Show This to Engr of Eng 101
At his Order

S S
C H

37 OK Freeman

WOULDN'T IT MAKE YOU LAUGH—OR CUSS—IF YOU WERE HANDED THIS?

OF all the old-timers who have looked at this "simple" little train-order and come away laughing, not one has admitted that he ever saw a stiffer proposition pounded out by a despatcher.

However funny it may seem, you may be sure that David Day and the hogger on old No. 101 didn't smile when this order was handed them one August evening, some thirty years ago. And to this day, railroad men who have seen it agree that it has never been beaten.

S. S., who signed the order, was Stephen Smith, superintendent of the Greenwood Lake Division of the Erie in those days. After he retired he became head of the Masonic Home at Burlington, New Jersey, where he still lives, hale and hearty.

C. H., whose initials appear under those of Smith, was Charles Haring, chief despatcher, who now owns a coal-yard at Piermont.

It might be added that, just to complicate matters, the division over which these

trains were ordered to do such acrobatic stunts was a single-track line. The text of the despatch follows:

6 52 P M.

31 JC 8-8-86.
DAY & ENGR. 1 PC.

Run wild between State Line and Jersey City until eight o'clock to-morrow A.M., following Engine 162, and keep out of the way of excursion-train with Engine 101, which will leave State Line at seven o'clock for Jersey City. Engine Six, after arriving at Little Falls with Train Thirty-Five (35) to-night, will run wild to Pompton Junction, and Engine Seven (7) will then return from Pompton Junction to Little Falls. Engine 163 will leave Jersey City at six o'clock to-morrow morning for Orange. Engine Five (5), between four and five o'clock to-morrow morning, will go from Pompton Junction to Ringwood. Keep out of the way of all of above wild trains and engines. Engine 101 will couple in with you and help you from Jersey City to Cooper. Show this to engr. of Engine 101 as his order.

S. S.

32 OK FREEMAN.

C. H.

LET'S FOLLOW THE FLAG TO FRANCE!

BY J. EUGENE CHRISMAN.

AWAKE! Ye knights of the key, awake!
From sea to sea, from gulf to lake
There rings a cry: "To arms! To arms!"
Will you not heed the war's alarms,
And follow the flag to France?

AWAKE! Ye knights of the key, awake!
Our nation's very life's at stake!
With thrill of bugle and roll of drum,
East, North, and South, and West they come
To follow the flag to France!

AWAKE! Ye knights of the key, awake!
From mountain peak to marshy brake,
From the Santa Fe to the Puget Sound,
Wherever the pounders of brass are found,
Come follow the flag to France!

AWAKE! Ye knights of the key, awake!
Would you the slacker's watchword take?
Are ye not then your grandsire's seed,
Who fought for the Right on Concord's mead?
Then follow the flag to France!

AWAKE! Ye knights of the key, awake!
Let's strike a blow for Freedom's sake,
And carry the roll of the conqueror Morse
To the aid of Pershing's hero force—
Let's follow the flag to France!

THESE MEN HAVE BEST OPR'S FIST.

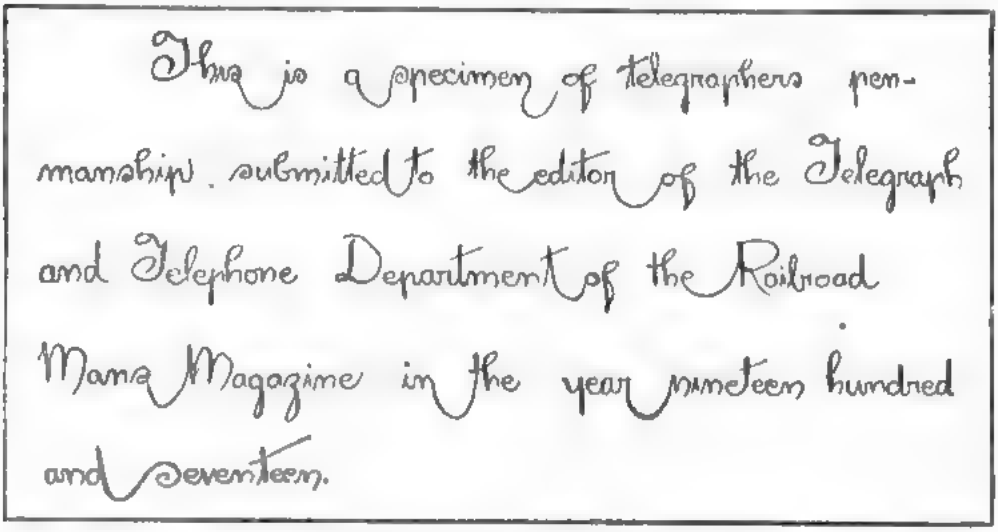
Winners of Handwriting Competition Are Benjamin H. Tidrick, Robert I. Flowers, and Harry H. Allen.

N the May issue of the RAILROAD MAN'S MAGAZINE the editor of the Telegraphic and Telephonic department invited railroad and commercial telegraphers throughout the country to send in specimens of their penmanship. Simple rules were submitted governing the contest, and we agreed to select from all samples submitted the eighteen most representative telegraph "fists," reproducing them in our pages, six in the August number, six in the September number, and the remaining six in the October number of the magazine. Each of the eighteen winners are to receive a year's free subscription to the RAILROAD MAN'S MAGAZINE.

Specimens from All Over.

When the contest was first announced we did not anticipate that it would receive the enthusiastic response which has rewarded our efforts. Hundreds of fist specimens have been received from all parts of the United States and Canada, and from the far-off island possessions.

Specimens were received from train-despatchers, railroad operators, commercial operators, radio operators in the government service, ex-telegraphers now in other


This is a specimen of telegraphers penmanship submitted to the editor of the Telegraph and Telephone Department of the Railroad Mans Magazine in the year nineteen hundred and seventeen.

BENJAMIN H. TIDRICK.

The notable characteristics of Mr. Tidrick's specimen are: speed possibilities, pen-control, alinement; exact formation of letters, and artistic appearance. With this fist a large number of words may be written on one sheet or blank without evidence of crowding. It is not a difficult hand to learn; but, in practising it, it is necessary to learn first to write it slowly, and gain speed with practise. All those heard from agree with the judge of the contest that Mr. Tidrick's offering is entitled to a place as one of the three best hands.

BENJAMIN H. TIDRICK

ROBERT I. FLOWERS.

H. H. ALLEN

lines of work, and from telegraphers now engaged in clerical capacities in railroad service.

From the eighteen specimens already published we reproduce in this issue those by Benjamin H. Tidrick, Robert I. Flowers, and Harry H. Allen, which are the three adjudged to be the best telegraph hands, the points considered being legibility, speed possibilities, and artistic appearance. As the high men, each of these contestants will receive a three years' subscription to the RAILROAD MAN'S MAGAZINE.

The Other 15 Successful Ones.

The other fifteen winning contestants, each of whom receives a year's subscription, are: W. W. Spafford, Chicago, Illinois; E. M. Shaler, Green River, Wyoming; F. R. Plunkett, Fort William, Ontario, Canada; E. R. Wakefield, Denver, Colorado; C. Percy, Big Spring, Texas; L. M. McCormick, Gainesville, Florida; Eugene Dyer, Lafayette, Indiana; Harvey G. Grofe, Boyertown, Pennsylvania; Earl C. Thompson, Indianapolis, Indiana; B. J. Dodge, St. Paul, Minnesota; W. E. Shelton, East Cleveland, Ohio; W. B. Ford, Annapolis, Maryland; R. M. Butler, New York City; C. P. Dickson, Raleigh, North Carolina; P. S. Pender, Granite City, Illinois.

In the October magazine we reviewed and classified all of the good specimens received up to a certain date, and commented upon their relative standing with that of the eighteen prize-winners.

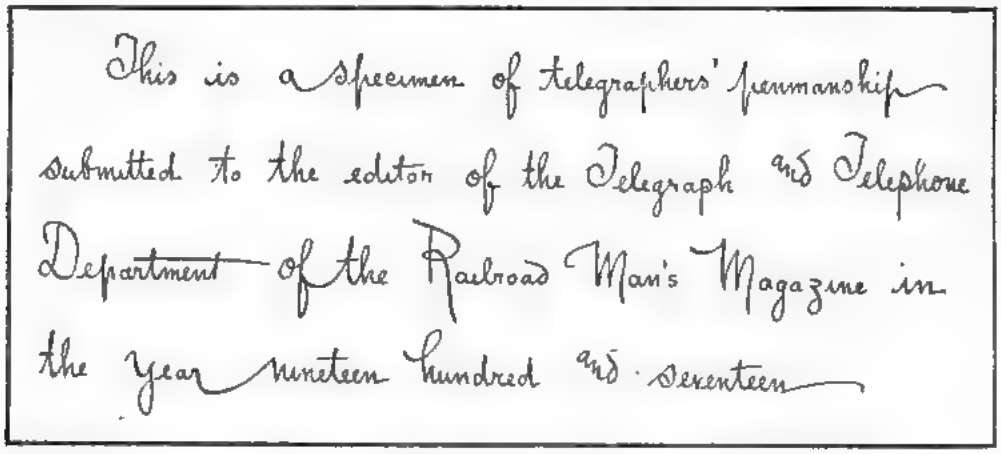
Since that time a great many additional specimens have been received, and in order to make the records of the contest complete it may be well here to review the best of those which arrived toward the close of the contest.

Sizing Them Up.

R. E. Martin, of the Denver and Rio Grande, forwards a second specimen which is much prettier than his original contribution; but it is written on paper so thin that his signature on the reverse side of the sheet shows through.

F. L. Reynolds, of the Denver and Rio Grande, forwards a second entry which has better word and line spacing than his original specimen. Mr. Reynolds writes a first-class telegraph hand.

Addie Phillips, of the Western Union, Jacksonville, Florida, submitted a second specimen practically identical with her first, except that the letters are made a little larger. Mrs. Phillips writes an unusually plain hand, and of a type which graphologists tell us denotes intelligence and strength of character.


This is a Specimen of Telegraphers' penmanship
submitted to the editor of the Telegraph and Telephone
Department of the Railroad Man's Magazine in
the year nineteen hundred and seventeen

ROBERT I. FLOWERS.

Since the original sample (reproduced herewith) was received from Mr. Flowers, we have seen several sheets containing matter written by him with a pen, the appearance of which is even more attractive than the above. The plainness and uniformity of the letter formation are remarkable.

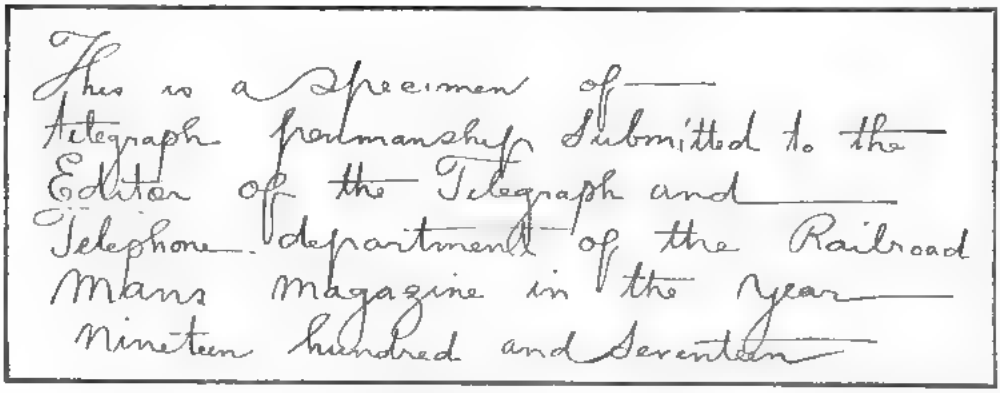
The style of penmanship in which the original copy of the Declaration of Independence was engrossed is not more beautiful or more readable than Mr. Flowers's penmanship. In fact about the only difference is in the slant of the letters.

W. C. Welfley, of the Western Union, at New Philadelphia, Ohio, also tries again, and his later specimen is better than his first entry.

Radio Operator Did Good Work.

Among the radio-operator entries the specimen submitted by Chief Radio Electrician Eugene A. Williams, at a Hawaii station, is excellent.

Other good specimens were received from E. E. Voyle, Gainesville, Florida; David W. Kyle, of Company C, Twelfth Engineers, St. Louis, Missouri; R. J. Cole, Jacksonville, Florida; Warren L. Barto, Cromers, Ohio; Raymond G. Halstead,


This is a Specimen of
Telegraph penmanship Submitted to the
Editor of the Telegraph and
Telephone department of the Railroad
Mans Magazine in the year
Nineteen hundred and Seventeen

HARRY H. ALLEN.

From the standpoint of speed Mr. Allen's fist is a prize-winner. We have reviewed several specimens of his penmanship. They all are alike, and each one bears unmistakable earmarks of rapid penning. It is plain that when Mr. Allen is writing with a pen he has in his mind an image of exactly how each word will appear on the paper before he has commenced actually to form it.

Andover, Conn.; C. A. Mabe, Granite, Colorado; L. A. Wenstrom, Baird, Ontario; H. L. Paden, Linesville, Pennsylvania; J. P. Mills, Wagstaff, Kansas; J. C. Humphrey, Luling, Texas; H. H. Erdman, Merrill, Wisconsin; C. O. Collard, Nebo, Illinois; L. J. Brodwolf, Chicago, Illinois; W. S. Arnold, Wenatchee, Washington; Floyd L. Overstake, Denver, Colorado; F. E. Stewart, Grants Pass, Oregon; Ralph E. Lewis, Assumption, Illinois; F. K. Sims, Plains, Montana; Harry M. Compton, Jersey City, New Jersey; and B. J. Brownell, of the Canadian Pacific Railway, Port Hope, Ontario, Canada. The specimens sent in by the last six listed gentlemen are high grade, and each contestant has reason to be proud of his penmanship.

Winners Are Real Artists.

In addition to reproducing the specimens of Messrs. Tidrick, Flowers, and Allen, we are glad to be able to present the likenesses of these three artistic gentlemen. They, as well as the remainder of the eighteen winners, and many other telegraphers, are artists in the true sense of the word. They do good work; they are careful; they take a pride in their daily tasks. We take rare pleasure and satisfaction in having discovered them and in making them famous.

Mr. Tidrick was born in Illinois, April 11, 1892. He has been a telegrapher since he was fourteen years of age. In a letter to the editor he says: "When a boy at school I was a miserable penman; but when I became an operator I gave my writing much thought and early determined upon learning how to write a good plain hand." We all now know how he succeeded. Mr. Tidrick is repeater chief for the American Telephone and Telegraph Company, Davenport, Iowa.

Mr. Flowers was born at Kansas City, on June 8, 1890. He also became an operator at the early age of fourteen, since which time he has worked every kind of press and commercial circuit, and at present works the New Orleans premium circuit out of Kansas City Western Union office.

In a letter to the editor Mr. Flowers states that he would rather telegraph than do anything else. He writes a fine letter, every line of which radiates good cheer and rare good fellowship.

Among the many praiseworthy results of this penmanship contest there is one which alone justifies the work we have done to make the competition a success. Although the judge of the specimens of penmanship submitted did not personally know any of the winners, his belief of long standing—that the really high-grade telegrapher is a man of exceptional mentality, of high morals, and generally in the pink of physical condition, has been conclusively verified.

Mr. Allen entered the telegraph business in the year 1896, at sixteen years of age. All of his experience has been in large offices throughout the South. At the present time he is with the Western Union at Gainesville, Florida.

To the railroad operators who have submitted samples of their penmanship we wish to say that we have received many letters from railroad officials, and from employees in other departments, commending the objects aimed at in the contest. Even the locomotive engineers were quick to sense the advantages which will accrue to the service from improved writing.

Engineer Commends the Contest.

One of the letters is from W. J. Edwards, engineer of the Pennsylvania Limited, running between Crestline, Ohio, and Pittsburgh, Pennsylvania. Mr. Edwards is the kind of engineer who can see other things besides the two shiny rails which stretch away ahead of his engine. He is alive to any betterment which means greater safety and the avoidance of train-delays.

In a letter to us on the subject of this contest Mr. Edwards says in part:

"It is very important that train-orders be written plainly and distinctly. I think the contest will do a great deal of good and will be a great inducement to operators to do careful work. I think the greatest good will come out of your contest—more than has come out of any article you have ever published."

We shall leave it to the telegraphers of the country to tell us when the time is opportune to hold another "fist tournament."

LUCK AND LOVE ON THE NARROW GAGE.

BY CHARLES WESLEY SANDERS.

One Braky on the Hardscrabble Road Does His Courting in a Manner Peculiar Unto Himself.

I'LL give you the *persona non grata*, as the highbrows say, of this piece right off the reel to save time. I don't like these stories where you have to read a page about the parties before you get to say howdy to 'em. Here they are:

Q. Peter Atwater, brakeman on the Hardscrabble Railroad.

Ben Montgomery, day operator at Morley.

Margaret Barr, agent's clerk at Morley.

The rest of us.

I suppose some young brass-pounder will start up in surprise to inquire which day operator—first-trick or second-trick. The answer is: all of the first and part of the second. This all happened up in Michigan on a narrow-gage pike that was a foot and a half wide, be the same an inch more or less.

It was before the days of three tricks for the ops. Then the ops worked eighty-four hours a week, sometimes more. Why, it was before that period when men had begun to part their hair and their names in the middle—about 1885, in fact.

The first time I met Q. Peter was in a beanery in Port Huron. I had just come in from sauntering over that railroad on the top of a box car and I was weary. Pete was sitting at a table, with a big cup of coffee in front of him. Being young and sociable, I sat down across from him.

"Have a coffee?" he says.

"As the first of a tubful, I will," I says. "What're you doing here?"

"Waiting to go out on my run," he says. "I'm called for something or other in an hour or so."

"Take your time," I says. "They probably won't really expect you till this time to-morrow. What're you going to do?"

"Flagging," he answers.

"Well," I says, "you want to be gentle with them."

"How's that?" he asks.

"Oh," I says, "always be gentle with a cow. All the flagging you'll have to do will be to flag a cow off the track now and then. Once a train starts on this pike nothing can catch up with it because everything else is as slow as it is."

Both of us being rails we introduced ourselves then. He give me his name all in a bunch.

"Why the Q?" I asked him. "Why do you want to hang a homely letter like that in front of one of the best names extinct?"

A kind of a dreamy look come into Pete's brown eyes. He shrugged his big lean shoulders after a bit and sighed.

"Maybe I shouldn't have done it," he says. "My mother named me Quincy Peter Atwater, but the boys soon begun to call me Quince. I couldn't go through life being called a quince. I'd have had to fight too often and I might hurt somebody. I got an awful kick in both hands."

"You look the part," I says. "And that's a nice, sentimental feeling you've got, though if I was built like you, I'd have an even dozen scraps before the sun set on this day. Shake, old socks, and let's proceed with that tubful, the next instalment being on me."

We shook and ordered. And that was the beginning of my friendship for Pete.

Well, he was a great boy. He was full

of them queer notions like not wanting to use his strength. One of his notions was to be nice to kids. Before he'd been running on that old pike long, he was on speaking terms with a dozen of 'em along the line.

Which brings me to Margaret Barr. She was an awful nice girl. She was one of these upstanding girls with a straight look for you and no silly snicker back of it. She had a lot of coppery hair and roses in her cheeks and kind of brownish-grayish eyes.

But for all her good looks I never heard any man refer to her as "some doll." She had too much of the real stuff in her.

Ben Montgomery was a nice enough lad in a way, though love did make a fool of him. He was no great shakes for looks, but he was decent and clean as men go.

Well, late that summer Pete and I came together on what they were pleased to call the local on that pike, Pete braking ahead and myself flagging.

We hit Morley one hot summer day about noon and Bill Quinn, our conductor, decided that that would be about the place for us to have our noonday meal. We never ate while we were running. We went in to clear and fed up solemn and proper.

When we had done that on this occasion, Pete gets up, yawns more than a man should at noon, and starts for the door of the old bus.

"Where away, buddy?" I asks.

"Be back in a minute," he says.

I didn't suspicion anything and he went out. Quinn finishes his snack and looks at his watch.

"We might as well lay here for One," he says. "It's as good a place as any. I'm tired."

He stretches himself out. As we had about forty minutes I went out on the platform, looking for Pete. I didn't see him and so supposed he was down at the old station, chinning with Montgomery.

I started down the track. To get to the station I had to pass the freight-house. When I came to the office, I give a look inside to see if Margaret was there.

She was! And so was Pete. Margaret was sitting at a desk, writing. Pete was sitting about three feet from her and he was holding a little girl, maybe four years old, on his knees. The little girl was looking up at him, her eyes as big as a Canadian two-cent piece. I could see Pete was telling her something.

"Clever, Q. Peter, aren't you?" I says to myself. "Gassing with Margaret's niece, so's you can sit by Margaret herself! Well, you don't seem to have swept her off her feet, the way her pen is traveling."

I took a look around and then I drew myself up on the platform real careful and tiptoed to the office door. Well, old Pete was breezing a yarn. It was one of those nice, scary yarns that kids dote on, and Pete's voice was going like an old-time organ back home on a Sunday eve.

Say, before I knew it I was leaning against the door-jamb, listening to that story myself. Pete was sure some minstrel man. I was still standing there when One came by and our engine tooted the flag in.

"I guess I've got to go," Atwater sighed.

"Aw," the little girl objects, "when do you come again?"

"To-morrow."

"What time?"

"Any time from noon till six o'clock," Pete says. "You can't tell much about this old local. But we'll be along some time."

"Well, I'm going to be down here," the kid says. "I want to know the rest."

"You come, then," says Pete. "It's got a dandy ending—Good-by. Good-by, Miss Barr."

"'By," says Margaret, without looking up.

Pete comes ambling over to the door. The little one followed him. Pete turned but he didn't look at the kid. He seemed to have forgotten her. His eyes was glued to Miss Barr's bent head with the sunlight shining on those copper strands. Then he comes out. I was waiting on the platform.

"Say," I says, "why don't you tell those stories direct to Margaret instead of spieling them to her second-hand?"

Pete looked at me. His eyes made me shudder.

I don't wonder he was wise to himself

about not fighting if he had ever gazed at himself in the glass and seen that look in his glims.

It was a cold, burning look. Yes, sir. It was ice and fire all in one.

I didn't let Pete say anything. I didn't want to listen to no speech if it was going to be a close brother to that look.

"He's whistled us in," I says. "We better hurry."

And I ran.

It took me several months to get all the dope on this story. I can't take that long telling it, so I'll stick in here what happened after the local pulled out that day.

The little girl listened till she couldn't hear the sound of the engine any more. Then she went slowly up to Margaret and laid her hand on her aunty's knee.

"Aunty," she says.

"Yes?" answers Aunty.

"Why don't you be that man's wife?"

You can see that Pete's fate lay in Margaret's answer. But Pete wasn't there to hear. He was standing on the platform of the local's caboose, staring back along those two close-together irons.

"Because, my dear little girl," says Margaret, "I don't love him."

"But I do," says the little girl. "He's a good giant and tells nice stories."

"Oh, well," says Margaret, careless, "you tell him and maybe he'll wait for you till you grow up and carry you off to his castle. Run along now and play."

Just like that! No blushes, not a word of pity for poor Pete.

And now Ben Montgomery comes to bat. He didn't go near the plate while Pete was there, on account of Pete's size, I guess, but as soon as the local had staggered on its way, he gets out for a while and meanders down to the freight-office. Seems Ben had been doing a little visiting at the freight-office himself, but he hadn't got any further with Margaret than Pete had.

"What was that fellow Atwater doing here?" Ben says, putting the very question he shouldn't have put to a girl like Margaret.

Margaret jumped right out of the middle of a column of figures. The roses died out of her cheeks and then they bloomed like Ben had never seem them bloom before.

"What!"

You get it, all right. She was mad like only a girl with copper-colored hair can get. Ben had a chance to back in to clear, apologizing for being out on the main in the way of the varnished cars, but he didn't back. Too mad himself, I guess.

"Mixing in with brakemen, are you?" he asks.

"The section foreman is coming down the track," says Margaret. "If you don't leave at once, I'll have him throw you out."

Ben left instant. It wasn't till he was back in the telegraph office that it came to him that the girl had threatened him with violence and he had run away. I guess he must have laid a bitter curse on Q. Peter.

Well, as luck would have it—and luck has most everything it wants—we were in to clear at Morley for One the next day. Pete repeats on his visit of the day before. He walks into the freight-office and takes off his cap.

"How's the little girl?" he asks Margaret.

Zowie! Margaret was still thinking about what Ben had said the day before, and she suspicioned that Pete was playing a fresh guy's game.

She gave Pete a look that was a next-door neighbor to the look Pete had given me when I had tried to kid him in my jovial way. But Pete was there with the soft word.

"Why," says he, "you don't suppose I meant you, do you? I meant the little girl that was here yesterday."

"Oh," says Margaret. "She's gone away with her mother to-day."

Pete told me afterwards that that was the first time she had ever really looked at him, and it was then he began to bring the watering-can to play very gentle on the flower of hope. For Margaret's eyes got soft.

I don't blame her; she'd have looked over many of us masculine beauties before she'd have found one that was more he-man than Q. Peter.

Then she blushed and her eyes dropped

down. Pete, whether he was wise to women or whether he didn't want to take advantage of that confusion of Margaret's, only stayed a minute longer.

When I see him come out of the office and walk down the track, I followed him. When I went into the telegraph office he was leaning against the window. Montgomery was copying an order and Pete had waited till he finished before he asked his startling question, which was:

"Hot, isn't it?"

Ben says never a word, busying himself with fixing up his clip-pad, there being no flimsies on this transcontinental highway.

"One ought to be showing up pretty quick, hadn't she?" says Pete.

Ben raised his head, having finished with the clip. Ben sneered. He flashed the danger signal with his eyes, that seeming to have become popular in our set.

"Go play with your dolls," says Ben.

"Huh?" Pete comes back.

"I said go play with your dolls," Ben repeats. "What do you want to come bothering a grown man for? I'm busy."

"Why, what's eating you, son?" Pete inquires. "What have I done to you?"

"To me?" Ben sneers. "What could you do to me? You only annoy me. If I had a stick of candy, I'd give it to you."

"Oh, I see," says Pete, laughing kind of relieved to find there wasn't anything serious bothering Ben. "You're trying to josh me about telling a story to that little girl yesterday. Well, I'm not ashamed of that. A man could spend his time worse, couldn't he? She climbed my knee and teased me for a yarn, so I spun one. Not that I make myself out to be a story-teller."

"And that's a plain lie," Ben busts out, madder than an engineer laid out with a busted steam-chest. "You're using that child just to talk to Miss Barr through. It's the lowest trick I ever saw a man play. That's the way I size you up, Mister Atwater."

"Why, man," says Pete, "you're clean off your base. It was just an accident that the little one was there."

"I've heard about you, you quince," says Ben, losing all control. "I'll bet you've got a girl at every station where your old rattle-trap stops. And I'll tell Miss Barr so, too."

You remember Pete had changed his name because a little thing like calling him a quince might make him fighting mad. Well, here was Ben calling him a quince and some more and making a nasty attack on his honor—which he had some of—at the same time.

Pete's eyes got that look they had showered on me the day before. He came up slowly to his full height.

"You'd better cut it out," he said.

"Shut your mouth," says Ben. "You can't get to me. I've got the door locked and you don't dare manhandle company property. You'd better beat it."

"You're not going to whisper anything to Miss Barr about me," says Pete. "You promise that and I'll go."

Then Ben made the mistake of cussing Pete in language violent and uncalled for.

"Open that door," says Pete, and I saw by the look of him why he had been afraid of himself.

"I won't," says Ben.

"I'll kick it in," Pete yells.

Ben stood up then. I guess he saw that he had gone too far. He had played with the sky as the limit because he was behind a locked door on company property and because he had misjudged Pete, who usually seemed a placid and good-tempered man.

"If you try any rough stuff, Atwater, I'll call for help," Ben says. "I'll have you pinched. You leave me alone."

His voice kind of cracked on the last word, for Pete was nearing the door already. I didn't want to see Pete kick that door in. I didn't know what he'd do, and he was a good pal of mine.

I ran up to him and grabbed his arm. I felt that arm go hard as a crowbar. Pete shook me off just like I was only a playful puppy.

"Don't you interfere," he says.

Without losing any time in arguing with myself, I decided I wouldn't. I went back to the window and through it I saw Ben run to the phone and take down the receiver.

As Pete's big foot crashed against the

door, Ben called the freight-house. He had time to say, "Hello" once when the door went down for a kickout.

Pete was across the room like one of these whirling dervishers. Ben let out a whoop you could have heard on the next section. Pete swept him off his feet and brought him to his knees.

Pete raised his hardwood fist. I would like to say I hid my eyes, but I didn't. Notwithstanding I had tried to stop Pete, I enjoy a rough-house about as well as the next man.

But Pete's blow didn't come down. His fist wabbled in the air for a minute and then he dropped it and stuck it in his pants pocket as if he was afraid to let it be loose. He gave Ben a shove that sent him sprawling and hustled out of the office.

"You poor little fish," he says over his shoulder, "why should I bother about you? I was crazy to lose my temper about you. You can make what report you please about that door."

I followed Pete outside. He started down the tracks toward the freight-house without a word from me. I trotted along behind him. I hadn't got my money's worth at the first show, so I thought I'd move on to the next.

When we got to the office, Margaret was yelling into the phone. The noise in the telegraph office must have sounded to her like they were getting together out on the main some place.

As Pete come into the office, she turned with the receiver still at her ear.

"Oh, Mr. Atwater," she says, "run to the telegraph office. There is something the matter over there. You are a big, strong man—"

"Hooray," says I to myself. "We're due for a thaw."

Pete walks across the room and takes the receiver from Margaret's hand and hangs it up. For a second their fingers touch.

I says to myself that this is where Pete clasps the fair lady to his manly chest. But he didn't.

"There's nothing the matter at the telegraph office," he says. "I just came from there."

"But Mr. Montgomery called—"

"He doesn't want you now," says Pete. "He only wants to be alone. But I want to talk to you."

Margaret promptly backs away from him. It seemed to me that Pete was talking very calm and steady, but I guess she must have caught something in his voice that I didn't.

"I want to tell you something," says Pete, his cap in his hand but his head up. "Montgomery and I had a disagreement just now.

"He said I had a girl in every port, like they say of the sailors. I haven't.

"He said I talked to your little niece just to make a good impression on you. I didn't.

"I came in here because I wanted to talk to you. I love you. I want you to marry me."

"Gee," says I to myself, "is that the way they do it? It's the first time ever I saw it done. There wasn't such an awful lot of slush about it at that. Sounded like a meat-order."

Well, Margaret lifts up her head and gives Pete a first-rate looking at. She looked right into his eyes and he into hers.

If I'd come on them then, I'd have thought they'd been talking about the weather or some such. I had took off my cap, prepared to fan myself, but now I put it back on.

"I thank you, Mr. Atwater," says Margaret, "but I can't."

I got ready for a grand smash from Pete. I thought he'd throw a worse fit than he did in the telegraph office. What he does is to smile and to say: "Thank you, Miss Barr. But I'll try again."

I dodged back of the door as he left. I thought maybe he'd be mad at me for listening. He went out without seeing me.

I took a peek in at Margaret then. I didn't suppose she'd mind, seeing that she was so cool about the business.

Margaret was kind of drooped back against the wall. Her long eyelids were down over her eyes. Her mouth was like a child's when it's going to cry. Finally she sort of shook herself and walked over to the window.

"Fiddlesticks," she says; but she didn't say it like you usually say that word, her voice being too soft.

"Fiddlesticks!" says I to myself in the usual manner. "I don't get this stuff. To look at her you'd think she was yearning deep for him."

I tiptoed out of there and went to the far end of the platform and hopped off. Pete was just passing the road crossing when I turned up the track toward the siding. Just then I heard One's whistle.

One was the road's only west-bound passenger-train. It had two passenger-cars, one baggage-car, and sometimes a freight-car. I've seen it make thirty miles an hour, but not often. This day I should say it was making twenty-five as it came into sight on its majestic way.

Pete stepped off the track to give One the right of way. He was maybe fifteen feet from the crossing. I stepped off the track, too, and I looked up at Margaret at the window and smiled.

Suddenly I saw Margaret's hand jump up to make her heart lie still. Her face turned white. She yelled.

I remember a couple of other little things. The crossing man began to hop up and down and yell and wave his flag. Quinn, on the platform of the local's caboose, straightened up and shouted.

Then I saw what was up and I began to run. Down the road which the railroad's tracks crossed, a child of four, maybe, had wandered. She was just moseying along, not paying much attention to anything in particular.

Once in a while her lips moved and she laughed to herself. She was bareheaded and the sun shone down on her light hair.

The outfit had begun to yell because the way they were going the little girl and One had a meet order right there on the track. Twenty-five miles isn't much for a passenger-train, but it would be enough in this case.

At the sound of the yelling Pete turned. For a handful of seconds he stared up and down the track. Then he looked at the window where Margaret was standing. She pointed and Pete saw the little girl.

The engineer saw her about the same time. That road didn't use air for anything except for the men to fill their lungs with, and the engineer began whistling for brakes like all get-out. He might as well have whistled for a bucket of suds. There wasn't any time for brakes.

Well, Pete's mind worked to perfection. He gives a jump and dashes for the little girl.

It seemed to me that he and the pilot got there just at the same second.

Pete stoops and rolls the little girl out of the way and the pilot wallops him. It was a pretty fair wallop.

I should say Pete traveled fifteen feet through the air before he hit a telegraph pole. Of course the pole refused to give way and Pete tarried there for a minute and dropped more or less graceful to the ground.

"I bet your back is broke, old pal," I says to myself. "'By-o! You were good while you lasted."

My throat was kind of burning when I got to Pete. Quinn and the section foreman and the crossing man and a couple of others arrived at the same time. Quinn, an old, old rail, had seen this thing happen many times before. He took command.

"Hands under his shoulders, two of you," he says. "Two under his laigs, two at his feet. All of you together now. Easy!

"Run, you, Maloney, and phone for the nearest doctor. Tell him to hustle.

"One of you gather up that baby and get her out of this. Poor scared thing! The man is hurted bad. So!"

Margaret was standing on the platform when we got Pete there. I expected her to be crying, but she wasn't. She was pale but calmer than I was.

We carried Pete into the freight-house office.

"Is he dead?" says Margaret.

Quinn had been picking at Pete's pulse as we carried him along.

"He is not dead," says Quinn. "He saved that little girl of yours, miss—that little niece that he was talking to here in the office. He talked about her that day for an hour, I do believe. He was a man like that, miss, to give himself for a little

one. When he wakes—ah me! 'Twill be to pain."

Pretty soon a doctor came bustling in. He knelt down on the other side of Margaret and felt Pete all over.

"He has a fractured arm and many bruises," says the doc. "But he'll be all right before long—good as new. We must get him up-town. Take him out to my carriage."

We carried him out and the doctor and some of the lads that didn't have to be moving on took him away. I went back into the freight-office, thinking I'd put in a word for Pete with Margaret. The boy should have something coming to him if he had saved Margaret's niece.

When I got inside I see Margaret with her head on the desk, crying her eyes out. That stalls me, so I beat it. Outside, Montgomery had just come up and Quinn was telling him how Pete had saved Margaret's niece.

"And she's in there, crying a bucketful of tears," I says. "They must be tears of joy."

I didn't expect Ben to be enthusiastic about how things had turned out, but I didn't understand the look that shot across his face.

He pulled himself up on the platform and went into the freight-house.

"Well," thinks I, "I'll just have a listen to be in on any knocks he hands to Pete."

I was at the crack of the door when Ben begun to shoot his face.

"Margaret," says Ben, very polite, "I'm sorry for the little dispute you and I had and I apologize."

"That's all right," says Margaret, dabbing at her eyes.

"For the love of sweet Annabel Lee! Is she going to make up to him?" thinks I. "What are women made of anyhow?"

"Everybody is inclined to be mushy about Atwater," says Ben, very soothing, "but there is no call for you to be in on that, Margaret. Quinn was off his base when he thought it was your niece that Atwater tossed off the track. It wasn't. It was—"

My heart went down into my boots. If this was straight, Ben was playing a trump card, with poor Pete up-town some place all bunged to pieces.

I takes a step forward to have a look. Margaret was standing by her desk. The fire in her eyes had dried up her tears.

"I know it wasn't my niece," she says. "I saw her from the window before Mr. Atwater picked her up. It was Mrs. Miller's little girl—that woman who lives just beyond the tracks.

"She lost her husband only two weeks ago. If she had lost her child to-day, she would have died. I know, because I have spent a good many evenings with her since her husband died.

"Mr. Atwater wasn't making what you would call a grand-stand play to me. He knew it wasn't my niece. He must have known. He was just saving a little child—any child.

"It's just like that with Mr. Atwater, I can see now. Do you know what Mr. Quinn said?" Ben shook his head.

"Mr. Quinn said, 'He was a man like that, miss, to give himself for a little one.' Do you understand, Mr. Montgomery?"

Ben didn't say anything for a spell. He only stood and stared at Margaret. At last he busted out:

"I understand you're going to marry Quince Peter."

"I'm not ashamed to say I am," says Margaret.

I went in to clear to let Ben by. Then I went into the office.

"Miss Barr," I says, "you've made a wise choice. Pete is all man and he's my pal. Lemme congratulate you—an' him. I'm glad it didn't take you long to make up your mind. It will make Pete feel easier when he wakes up."

"Oh," says Margaret, "I was afraid this afternoon that I would do it—when he was in here and talked to me so and looked at me so."

The engine whistled for the flag. I beat it, but the head end got no go-ahead from me till I had run over to the drug-store and got me a headache-powder.

She was *afraid* that afternoon! Give me a good pal, a good brand, and plenty of cheese-sandwiches, and leave women out of it for mine.

FROGS.

First operation of cars by the overhead trolley system in a large city was in Brooklyn, New York, in 1888.

More than 10 per cent of the grain cars arriving in Chicago over the Great Western's tracks show leakage.

To eliminate the 17,100 grade crossings in Illinois would cost an average of $30,000 a crossing, or a total of $500,000,000.

A baby, 18 months old, hit by a New York Central train, was saved from death when his dress caught in the cow-catcher and he was lifted clear of the ground.

All railroad men who have enlisted will get their jobs back at the end of the war, according to a plan to be adopted by 115 lines in the United States and Canada.

Railroad transportation is probably the only commodity, relatively speaking, that has decreased in price in the past three years, according to R. J. Clancy, of the Southern Pacific.

Dr. William Brady called off his suit against the Pennsylvania for one cent when he found his wife had got a drinking-cup out of one of their slot-machines for nothing, thus squaring his account.

New York State Court of Appeals has decided that a man can be thrown backward when train stops suddenly. This ruling reverses the Supreme Court, which held he must be thrown forward.

Southern Pacific has several "tramp traps." They are freight-cars left in condition to invite tramps. After a number of them have boarded one, the doors close mysteriously and they are prisoners.

The Humboldt, crookedest river in this country, which flows through the central portion of Nevada, crosses the Southern Pacific tracks 28 times, necessitating as many bridges which cost in all $654,000.

The New York, New Haven and Hartford expects to open its mammoth bridge across the Thames River at New London, Connecticut, in 1918. Building of the superstructure has been delayed by the war.

Man suing a railroad for falling from a car is found to have worn at the time of the accident two undershirts, two pairs of drawers, three overshirts, a night shirt, two pairs of trousers, two coats, and two overcoats.

High cost of living is hitting Miss Railroad mighty hard these days. Some of her troubles are: increase in manganese, 488 per cent; white lead, 353 per cent; boiler flues, 169 per cent; axles, 227 per cent; fire-box steel, 231 per cent.

J. F. Stevens, chairman of the American railway commission now in Russia, has telegraphed for a railroad unit of 129 men, consisting of division superintendents, despatchers, trainmasters, engineers, master mechanics, and a telephone expert to be sent to Russia.

A passenger on rear platform of train of ten 70-foot cars on Shasta Route of Southern Pacific can see the engineer in his cab, twenty-five feet higher up. At the same time bottom of locomotive's driving-wheels are eight feet higher than top of car in which passenger is sitting.

Locomotive whistle originated on May 4, 1833, when Stephenson's engine ran into a market cart. A directors' meeting was called, and the inventor suggested a whistle blown by steam. A musical instrument maker constructed the trumpet which looked like a huntsman's horn.

TURNER, AIR-BRAKE WIZARD.

Interested in Triple Valve by Accident, an Unlucky Sheepman Became World's Authority on Westinghouse Appliance.

MORE THAN 400 INVENTIONS TO HIS CREDIT.

His Device Increased New York Subway's Capacity 300 Per Cent—Perfected "K" Triple Valve, without Which Enormous Trains of Present Could Not Be Operated; Now 2,000,000 Are in Use and Patent Is Valued at $28,000,000.

BY CHARLES FREDERICK CARTER,
Author of "When Railroads Were New."

SOME bonehead at Raton, New Mexico, forgot to open the angle-cocks after he had coupled the air-hose between the two engines of a double-headed freight train west bound on the Santa Fe one July day in 1897.

In other words, he turned a heavy train loose on mountain grades without brakes, leaving the engineer and trainmen to discover their helplessness when the time came to use the brakes, which, of course, was everlastingly too late.

They Cer-tain-ly Met.

This train had a meeting-point with an east-bound train, double-headed, at Dillon three miles west of Raton. The east-bound train, which was going up-hill, stopped on the main line below the farther switch to wait for a light engine and the west-bound train to head in on the passing track.

Well, those trains met, all right; they cer-tain-ly did! That meeting smeared five engines and some forty odd cars over New Mexico and killed seven men.

Next day some of the wrecking-crew were holding an unofficial *post mortem* on the affair, when one of them, kicking a triple valve that had been broken loose from its attachments, said:

"There's the thing that caused the trouble."

The triple valve, which is attached to every car equipped with air-brakes, is so called because it fulfils the three-fold function of charging from the train-pipe the auxiliary reservoir whence compressed air passes to the brake-cylinder to apply the brakes, applying the brakes and releasing them in obedience to the movements of the engineer's brake-valve. It might be termed the nerve-center of the brake-system; but no triple valve has yet been invented that will operate air-brakes without air, and this particular triple valve was cut off from the engines, as you will recall.

The plain truth is that the oracle who had just handed down the decision knew less about the cause of the wreck than he did about the binomial theorem; his chief concern was to maintain one of the most

sacred liberties of the railroad, which is the right to blame the air-brakes for all the bulls of all the boneheads.

But a passing ranchman who had stopped to rubber did not know this; so he marveled greatly that so insignificant a bit of apparatus could cause so bad a muss.

When the ranchman left the scene of the wreck that triple valve, so unjustly accused, wasn't there any more. So much having been confessed, you may as well know the whole shameful story.

The ranchman took that thirty-six pounds of cast iron and brass, value fourteen dollars, to his home, a very modest cottage on the outskirts of Raton, locked the door, drew down the blinds and gave that triple valve the third degree.

He smelled it, tasted it, pinched it, tried to look into it, and held it to his ear as you do a shell to hear the roar of the sea. He poked wires into its vitals, blew smoke through it and—

Say! Remember what a scandal there was when soldiers were accused of giving Filipino insurrectos the "water cure"? Well, the ranchman did just that to the triple valve.

Hist! The Deteckatives!

How long these outrages might have been kept up will never be known; for the ranchman became aware that Santa Fe secret-service men were snooping around his part of town. The detectives were merely trying to find out what had become of a lot of company tools that had disappeared; but the man whose hands were stained with the rust of that triple valve imagined they were on his trail. Verily, a guilty conscience needs no accuser!

The ranchman slipped out of town betwixt sunset and sunrise, staggering under the weight of metal and entrenching tools. Far away, amid the cactus and the sagebrush, he buried the mangled remains of that triple valve—buried them darkly at dead of night, just like the burial of Sir John Moore, you know.

From that lonely grave on the hillside has sprouted a chain of events that has affected profoundly the history of the world. More than a million New Yorkers who are now squeezed and suffocated twice daily in the subway that was built to carry 400,000 passengers would have to go by hand or stay at home but for this affair of the triple valve; for it was first in a sequence that quadrupled the capacity of the road.

Rendered Other Inventions Effective.

To the same cause can be traced the remarkable series of inventions that put the final seal of effectiveness on other steps in the tremendous development in railroad transportation in the last fifteen years—a development without which the nation's commerce would long since have been strangled, bringing stagnation to industry and starvation to millions.

Without the transportation facilities to coordinate the nation's industries we could not play our part in the world war; without our aid the Allies might be defeated and democracy banished from the face of the earth.

Before that triple valve succumbed it had yielded the inmost secrets of its soul, its mode of operation, and the reasons it did not do better, to its tormentor, who prior to that turning-point in his career would not have known an air-brake if he had met one in the street.

In this strange way Walter V. Turner, late ranchman, now manager of engineering of the Westinghouse Air-Brake Company, first had his attention attracted to the air-brake and at the same time laid the foundations of his extraordinary knowledge of that art which has won for him the sobriquet of "the Air-Brake Wizard"; which has earned the award of the Elliott Cresson medal for his eminent services to mankind by the development of the air-brake; that brought him fellowship in the Royal Society of Arts, London; that led Division 251 of the Brotherhood of Locomotive Engineers to present him an engrossed memorial expressing "our deep feeling of gratitude . . . for using your extensive knowledge of the air-brake system with the proper authorities for the betterment of all concerned, so that the old fear and dread to tip the crest of our moun-

WHEN SOMETHING HAPPENS TO AN AIR-BRAKE THAT NO ONE CAN UNDERSTAND, THEY TURN TO A ONETIME RANCHMAN AND HE TELLS THEM WHAT'S WRONG. WALTER V. TURNER, THE WIZARD WHO PERFECTED THE "K" TRIPLE VALVE, IS THE WORLD'S GREATEST AUTHORITY ON THE SUBJECT

tains has passed away"; that prompted the Air-Brake Association at its 1912 convention to present him an elaborately engrossed memorial "in consideration of the many vital improvements made by him in the air-brake art" which "entitle him to this recognition of our high esteem for his great services to the cause of humanity and science"; that caused George Westinghouse, just before he died, to say to him:

Wears the Mantle of Westinghouse.

"Turner, you have taken up my work where I laid it down, and you are doing it well."

If you will bear in mind that although hundreds of men have collaborated to develop the enormously heavy trains of to-day and the locomotives to haul them at high speed, nevertheless, the means of controlling that speed, thereby rendering the efficient operation of the railroads possible, have been developed by two men only—George Westinghouse and Walter V. Turner—you will be better able to appreciate the Air-Brake Association's reference to the latter's "great services to the cause of humanity and science."

Westinghouse originated the air-brake and, adapting it to the requirements of cruder days, built brakes to stop trains.

But while the weight of advancing years was bearing more and more heavily upon the great pioneer progress was quickening its pace. Dense traffic demanded means of control that would permit its unhampered flow. Turner stepped into the breach and provided brakes that would keep trains running.

Yet, as you have begun to suspect, the story of this same Turner is one of the most picturesque and dramatic to be found in all the fascinating history of the railroad. If you have a few moments to spare let us hit a few of the high spots in his eventful career and so obtain an insight into the mysterious ways in which Destiny moves to accomplish her ends.

Turner is an Englishman who began life with two liabilities: one was a disposition more adapted to a world alleged by those who have never been there to be better than this, but which is singularly unsuited to a planet which always has to be improved by violence; the other was an ambition to become a textile engineer, which is a calling about as exciting as teaching the infant class in Sunday-school.

So Destiny had to put him through a course of sprouts in order to fit him for his life-work.

Mills in those days were having a great deal of trouble with American wool which, in outward appearance, was sound, but which caused weak spots in the cloth that rendered it worthless. So the embryo textile engineer resolved to find out about it.

He did not know it, of course, but Destiny was putting up a job on him to work an excess of amiability out of his system. How well the ruse succeeded may be gathered from this tribute uttered years later by an enthusiastic admirer:

"He's the (*word deleted by censor*) man I ever saw. He's an angel without wings. But one thing I do know: he can fight like——"

Really, there is no occasion to repeat such rude language.

He came to America and in due time found a job on the ranch of F. D. Wight, near Folsom, New Mexico, the stock on which included 33,000 sheep. One winter day while riding the range with the manager of the ranch the latter was attacked by a mad lynx. Turner killed the brute with a knife and cut its jaws loose from the manager's arm.

A few days later the manager died in agony from hydrophobia, leaving Turner to run the ranch with its population of five hundred Mexicans, Indians, and cowboys. He did it so well that the owner retained him in that position.

The Why of Rotten Spots in Wool.

During his third winter on the ranch the Englishman introduced the revolutionary practise of cutting out weak sheep and feeding them to save their lives instead of letting them rustle for themselves or die, as was the immemorial custom of the range.

One day a sheep he took hold of dropped to the ground from weakness, leaving a bunch of fleece in his hands. The cause of rotten spots in woolen cloth stood revealed.

In winter, when forage is scarce, the sheep live partly on their fat. When that is gone the nutriment that should go to make wool is requisitioned to keep life in their bodies.

Thus the wool that grows during this period is weak, although it does not differ in appearance from the summer growth. When grass comes again and the sheep gain in strength the wool improves in quality; but as it is not sheared for some time there is a spot in the middle of the fiber much inferior to the rest.

The remedy? Simplest thing you know: Shear your sheep as soon as the wool has grown a quarter of an inch from the hide after grass comes, thus cutting right through the weak zone and obtaining a fiber of uniform quality. All of which is now set forth in the text-books, thereby insuring you and me dependable clothes.

Four years on the ranch made for the Englishman a reputation that won a better-paying place as manager and secretary of the Lake Ranch Cattle Company, fifty miles from the nearest railroad. Bob Ingersoll and S. W. Dorsey, of Star Route fame, each thirty miles away, were the nearest neighbors.

Soon Turner was a partner with an Eastern capitalist who was glad to put up his money against Turner's experience. He retained his position with the Lake Ranch, managing both properties.

Carved, Clubbed, Chewed and Clawed.

Ranch life in the Southwest in those days was just one blamed thing after another. Turner was shot in the eye, neck, leg and other localities until his anatomy would have answered for a colander; he was carved, clubbed, chewed and clawed by Mexicans, cowboys, mountain lions and other varmints. To paraphrase Longfellow—

> Each morning sees some scrap begun,
> Each evening sees another one.

One of the great trials of Turner's life was Mexican sheep-herders who claimed an inalienable right to his choicest ranges on the ground that their ancestors saw them first. His principal job was shooing these Mexicans, with their primitive ideas of property rights, off the premises.

While on one of these Mexican roundups, accompanied by one of the ranch owners, who may as well be called Van as anything else, he came across a Mexican trespasser. Turner had left his gun at home, a gross breach of range etiquette; but as the Mexican was dopey from sleep Turner headed the gentleman off before he could get into his tent after a weapon.

Some Job, Shooing Mexicans!

Van, a rank tenderfoot from the Great White Way, was given an ax and told to herd the Mexican while Turner hunted up the latter's burros and packed the camp outfit on them. Then the whole party set out to find the Mexican's boss.

The party proved to be one Louis Pacheco, with whom Turner had had several scraps, an ugly customer whose trademark was a sardonic grin that got Turner's goat. Unarmed as he was, Turner rode up to Pacheco, dismounted and, holding his horse so that it could be used as a breastwork if necessary, began explaining to Señor Pacheco how naughty it was for Mexican sheep to eat gringo grass, emphasizing each telling point by his favorite gesture with extended forefinger.

Señor Pacheco's idea of repartee was to try to slice off that finger with his knife. The best he could do was to cut a chunk out of the neighboring thumb.

Turner seized the *señor's* wrist, whereupon the latter shifted the knife to his left hand and made a pass but missed. Turner seized the left wrist, forcing the Mexican to drop the knife. Then the Englishman held on, waiting for the Mexican to tire himself out struggling.

He was doing fine until the *señor's* dog undertook to dine off Turner's calves. Turner kicked at the dog, missed and fell, with Pacheco on top.

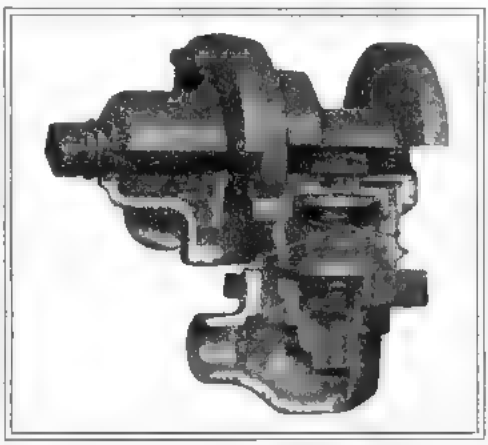
By this time Turner was getting weak on account of that thumb—or thought he was until subsequent events induced him to wake up and get busy. Pacheco regained his knife and raised it for a blow just as the dog returned to the attack.

Turner landed a kick under the dog's

jaw that put him out of business and turned his shoulder so that the descending knife, instead of going through his heart, severed his suspenders behind, without scratching the skin.

After a further brief struggle Pacheco found a chance to aim a blow at Turner's groin. This time he landed fair in that part of Turner's trousers where his groin would have been if the former blow had not cut the suspenders and allowed the said trousers to slip down.

At this instant the faithful Van, who had been herding the other Mexican, ax in hand, according to orders, deserted his post long enough to pick up a pair of brass knuckles that Turner had dropped from his pocket in the struggle and return them to their owner. Half a second later Señor Pacheco, losing all further interest in the proceedings, rolled over to take a little nap.



THE ALADDIN S LAMP OF THE AIR-BRAKE WORLD WAS BOXED UP AND SENT TO ITS JINNEE MANY YEARS AFTER HE HAD STARTED WORKING MIRACLES WITH THIS "BORROWED" TRIPLE VALVE.

Turner got up and secured the knife, whereupon the horrified Van rushed up, shouting:

"Oh, don't kill him! Don't kill him while I'm here!"

"Well, if I can't kill him I can talk to him, can't I?" pleaded Turner.

No authentic record of Mr. Turner's few well-chosen remarks is extant; but anyway, Señor Pacheco, his herder and his flocks went away in a hurry, the former still wearing that sardonic grin which, to the great disgust of friend Turner, would never come off.

Van hit the trail for the nearest railroad station, not even stopping to eat; and he has never ventured west of the Mississippi since. But Pacheco secured his rifle and announced that he was going to kill Turner on sight.

He stopped Manuel Rial, a teamster on the ranch, to tell him the good news, which met Manuel's enthusiastic approval—until Louis incautiously laid down his rifle, whereupon Manuel snatched it up, smashed it over a rock, made some very rude remarks to Señor Pacheco and hurried home to warn his employer what was up.

At the same time word came that Garcia, a worthless son-in-law of Dolores Romero, a very wealthy Mexican rancher, the employer of Pacheco, had also proclaimed his purpose to kill Turner on sight. Mounting his horse, Turner started straight for Romero's ranch, leaving as his parting instructions:

"If I'm not back by four o'clock, get four or five cowboys and come down; for there'll be something doing."

Riding suddenly around the corner of the ranch-house, Turner found himself face to face with Garcia and Romero.

"I hear you are going to kill me."

"Yes."

"When?"

"Now," replied Garcia, reaching for his gun.

"No, not just yet. If there's going to be any killing I prefer to do it myself," retorted Turner as he covered Garcia.

Talk Made the Peace Dove Coo.

The Lake Ranch Cattle Company had been trying for nineteen years to get on friendly terms with Romero, but had failed. Still keeping Garcia covered with his gun, Turner began to parley with Romero, talking so quietly and so convincingly, without any show of passion or prejudice, that he completely won the old man's heart and then Garcia came across also.

What had been billed as a shooting-scrape ended in a neighborly visit; and

when Turner rode away he carried with him a cordial invitation to bring his family over for a visit the next Sunday. When a Mexican invites you to exchange family visits he has gone the limit.

Having been so disappointed by Garcia, Turner decided to hunt up Pacheco to see if he couldn't get killed there. After a long ride across the hills he came upon a man asleep.

He was beside the sleeper with drawn gun as the latter opened his eyes, still wearing that sardonic grin, and reached stealthily for his shooting-iron. But the eloquence of Turner's forty-five persuaded him to forget it and roll over and over until he was a safe distance away, whereupon Turner dismounted, secured his adversary weapon, and sat down for a chat.

He soon convinced Pacheco of the inadvisability of killing him after he had become a friend of Romero's, especially when Pacheco had been clearly in the wrong in trespassing; but the Mexican still had an unsettled account.

"You took my knife, and you broke my gun; or your man did, which is the same thing; and no man can disarm me and live."

"Oh, if that's all, I'll buy you a new knife and gun," retorted Turner cheerfully. "I'd like to keep your old knife as a souvenir of the auspicious occasion; but I'll buy you one just as good or a better one if you'll tell me what you want; or I'll give you the money and you can buy the knife and gun yourself."

So they settled it on that basis, and Turner rode off, taking the precaution to carry the Mexican's gun a quarter of a mile along the way.

Foxed the Locoed Cowboy.

Volumes more might be written along the same line, including a blood-curdling tale of a locoed cowboy who started in to clean out the ranch one night and did succeed in getting four men before the rest shot him to pieces when Turner, penned in a building the only exit from which was commanded by the cowboy who was running amuck, made him reveal his hiding-place by holding a hat on a stick in front of a window to draw his fire; but for lack of space we'll have to cut out the Wild-West stuff and get down to air-brakes.

Suffice it to say that, having taught him to conquer opposition first and argue later, Destiny considered Turner educated and so pried him loose from the range by breaking him up in business through the medium of a free-wool tariff and a law turning the cattle men out of Indian territory onto the already crowded ranges farther to the Southwest.

Turner was slow to take the hint. He hung on until he didn't have a plugged nickel to his name. Then he moved his family to Raton and gratefully accepted a job as car-repairer on the Santa Fe at $2.25 a day simultaneously with the episode of the triple valve, already described.

Then Destiny got busy.

Went to a Valve-Show.

One month after his début as car-repairer Turner was promoted to gang-boss. A few days later he heard that a sectional triple valve was on exhibition at the roundhouse for the instruction of engineers and firemen.

Noon could not come soon enough for him that day. Without wasting any time on lunch Turner hot-footed it to the roundhouse, where he found a group of enginemen in front of the sectional triple valve, which was enclosed in a pine box painted red, with a glass front to protect it from impious hands. The interior was lighted by an incandescent lamp.

An animated discussion was going on, but no one seemed able to figure out the operation of the valve. So Turner spoke.

"Gentlemen, I believe I can tell you how that valve operates, if you'll let me."

The knowing ones exchanged winks and prepared for a hilarious time with the presumptuous car-repairer who thought he knew more than they about apparatus they handled. They egged him on to make a fool of himself.

Then with gaping mouths and bulging eyes they listened to a simple and lucid explanation of each function of the triple valve and the reasons therefor that could not have been surpassed by Westinghouse himself. Right then and there he won the admiration, respect, and friendship of the

enginemen of the Santa Fe, sentiments which increased in strength with each passing day.

And the amazing part of it is that every scrap of information embodied in that historic lecture on air-brakes was obtained by analyzing that triple valve that Turner—that Turner—well, that Turner "borrowed" from the wreck when the Santa Fe wasn't looking. It was the first triple valve or any other part of an air-brake system that he had ever seen, and the last until he saw the dissected one in the roundhouse.

Afterward the enginemen christened that sectional triple with its incandescent light "*Aladdin's* Lamp." Some years later they boxed it up and sent it with best regards, in memory of old times, to Turner; and it stands in a place of honor in his office to-day.

After the lecture Turner asked permission of the roundhouse foreman to keep company with that sectional triple valve when off duty, and spent most of his free time there.

No doubt this dissipation accounted for his inability to hold a job any length of time.

In less than four months he had lost his place as gang foreman and had been promoted to inspector; in two months more he was assistant car foreman; then foreman of the wheel-house, where car-wheels were turned and fitted and nuts and bolts were made; and at the same time he made himself general assistant to everybody. In three years he was chief inspector and in four years general car foreman.

"Orders Is Orders!"

"A primrose on the river's brim, a yellow primrose was to him"; which is to say he took orders at their face value. So when the new general car foreman received an order not to let a car out of Raton yards on to those mountain grades unless the air-brakes were in perfect working order, he thought it meant just that.

In those days air-brakes were not understood nor appreciated as they are now; and, besides, the Santa Fe was not overburdened with wealth then. So it happened that most of the cars that came to Raton arrived with air brakes in bad order.

The car-repairers were soon swamped with work, and as orders said not to let 'em go till the brakes were fixed Turner soon had the whole road balled up.

How They Did Fire Him!

Talk about trouble! Why, you don't know the meaning of the word. But Turner can tell you. The whole blamed Santa Fe system came down on him like a thousand of brick. They yelled at him, reviled him, made faces at him.

And how they did fire him! Every few minutes the trainmaster or the superintendent or somebody would fire him.

The general superintendent, now general manager, took particular delight in firing Turner. And the then general manager journeyed all the way out to Raton for the pleasure of firing Turner in person.

But Turner flashed the orders on him, and he, gracefully acknowledging that the general car foreman could not do otherwise than as he was doing, reinstated him. And so it went. While Turner spent most of his time in the air, he invariably landed on his feet when he did reach the earth.

Soon the great truth began to dawn on all and sundry that when Turner let a car go there was no trouble with it; that trains did get over the road, once they were past Turner; and then there was no further trouble.

Some new locomotives proved not to be up to contract; Turner took them in hand and made them haul a hundred tons above their rating, thus making firm friends of the superintendent of motive power and the head of the locomotive works that built the engines.

They sent him over the system to investigate car conditions. He took car numbers, trains, and dates in revealing conditions that shocked the officials. When he refused to give up his original memoranda the assistant superintendent of motive power fired him.

Along came the general superintendent, who had once taken such delight in firing Turner, now his stanch friend, and vowed with a mighty oath that Turner shouldn't

stay fired, not if he had to carry the matter up to the president himself. And he didn't wait to eat lunch till Turner was back in the fold.

Turner was ordered to Topeka. It was here that he first met the superintendent of shops, now general superintendent of motive power, who, like the others, at first misunderstood Turner, but later rendered valuable assistance in his work.

The Santa Fe had obtained an air-brake instruction-car, and the instructor, having by chance overheard Turner talking air-brakes, had gotten cold feet and refused to teach on a road that had men who knew more about air-brakes than he did. So they wanted Turner to take out the car.

Platforms Built for Overflow Audience.

The first stop was at Chillicothe, Illinois. So great an audience gathered that they had to build platforms so that the overflow could see and hear through the windows. The last man to fire Turner was in that first audience; and when the lecture was over he was the first man to grasp Turner's hand and congratulate him.

At every stop platforms had to be built to accommodate the audiences that flocked to hear Turner. There was a prompt and remarkable improvement in the handling of trains.

From general air-brake instructor he was promoted to mechanical instructor for the whole system.

Meanwhile the Westinghouse Air-Brake Company, being naturally more or less interested in air-brakes, had sent Chris Cass out to see what manner of man was put on that instruction-car. Chris heard that first lecture and stayed with the car until it got to Topeka. His report was so full of enthusiasm it almost blew up the general offices when it was received.

While this was going on Turner had been busy with improvements for the air-brake. He had taken out twenty-two patents, which he sold to the Westinghouse Air-Brake Company. The company could make neither head nor tail of them; it began to see that it would have to corral Turner if it was to get its money back.

The 1902 convention of the Air-Brake Association was held in Pittsburgh. Turner was asked to speak. He spoke. He was a heretic regarding the perfection of standards as they then existed. He stirred things up for fair.

The association was invited to inspect the works at Wilmerding. Turner went along, but instead of getting into the works the general manager invited him up to the office and offered him a position with the company. Turner refused.

While the two were talking a telephone call came from Philadelphia. The general manager of the Pennsylvania said that something was wrong with the air-brakes on an engine that the railroad folk could not fix. He wanted it attended to immediately.

The general manager was going to send the trouble-man down from New York; but Turner, on hearing what the difficulty was, told how to remedy it.

In half an hour the telephone carried the news that Turner's prescription had worked perfectly. Naturally this made the general manager more insistent; but Turner was adamant. He was doing useful work and was happy in doing it. Why change?

Thereupon the general manager wrote to Turner's boss, who told that gentleman he was making a mistake in not accepting the offer, but to no avail.

The 1903 Air-Brake Association convention was held in Colorado Springs. The same old general manager was on hand with a renewal of his offer.

A Revolution of Door and Decision.

Turner again refused, and started to leave the hotel. But as he was passing through the revolving door he remembered that it was exactly a year since the offer had first been made, and reflected that, perhaps, he was making a fool of himself by not accepting.

So he stayed right with that revolving door until it landed him in the hotel again, and, walking up to his tempter, said that if the offer was still open he would accept it, provided matters could be fixed up with the Santa Fe.

But things had changed now. The Santa Fe was not willing to let go of the employee

who had been fired oftener and in more different ways than any railroad man on record.

Negotiations were begun in May; it was November before Turner was loaned—not released, mind you—by the Santa Fe to the Westinghouse Air-Brake Company for two months to work out some problems. Turner worked out the problems, drawing salaries from both companies, and returned to the Santa Fe on schedule time.

The general manager wasn't satisfied. He wanted Turner back. Hearing that the Westinghouse people were after Turner, the Santa Fe enginemen got together, and, believing that nothing more than a question of salary was involved, offered to make up to Turner out of their own pockets the difference between what he was getting from the railroad and what the air-brake company offered if he would stay on the Santa Fe.

Lionized by Engineers.

Of course Turner could not accept this generous offer, whereupon Division 251 of the Brotherhood of Locomotive Engineers had the following memorial, signed by eighty-one engineers, engrossed and presented to Turner when he finally did leave:

> The engineers here wish to express in their humble way their deep feeling of gratitude for your many generous acts, invaluable information, and for using your extensive knowledge of the air-brake system with the proper authorities, to the betterment of all concerned, so that the old fear and dread to tip the crest of our mountains has passed away
>
> While the deepest regret prevails over your departure from this service, we one and all rejoice in your advancement, and feel assured that not our own company alone will be benefited, but the entire world where the Westinghouse air-brake is in use.
>
> Your employers chose well, and we are confident that entire satisfaction will be their reward. In saying good-by we one and all wish you Godspeed.

To cut a long story short, Turner was again loaned—*loaned*, remember—by the Santa Fe, which carries his name on the pay-roll to this day, to the Westinghouse people.

Turner had long been a hero-worshiper, his hero being George Westinghouse. He had once thought if the day might come when he could see Westinghouse walk by on the farther side of the street he would be happy.

Now he could do more than that. He could work in the same laboratory, the same offices with his hero, and even talk with him on terms of perfect equality.

But Westinghouse was set in his ideas, as great men are apt to be. It was then that Turner really cashed in on Destiny's teachings on the ranch; that is, to fight so that your antagonist is converted into your stanchest friend. On his part, Westinghouse was happy in finding a worthy assistant.

The first task was to perfect Turner's famous K triple valve, now in universal use in freight service, at a cost of $210,000 in experimenting. The K valve was brought out in 1906 and was in commercial use in 1907.

Three years later 229,000 had been sold for $3,000,000. Now 2,000,000 are in use.

In a patent suit the K triple valve was valued at $28,000,000. The enormous freight-trains of to-day could not be operated without it.

Made 4 Trains Run Where 1 Ran Before.

In quick succession came a long list of radical improvements that have literally realized Turner's ambition "to make four trains run where one ran before." These included the empty and load brake, a device that by turning a lever renders the full braking-power of a car available whether loaded or empty.

Formerly only the empty braking power could be used, because if the brakes were adjusted on a loaded basis the wheels would be slid when the car was empty. A train of loaded cars with only empty braking power cannot be handled with safety on more than a two-per-cent grade, and there are lots of grades greater than that, to say nothing of the continuous necessity for full, and more particularly uniform, braking power under other circumstances.

The New York Central's fast trains required a distance of 1,780 feet to stop under given conditions. This would not do, so Turner was sent for to improve matters. He went up to Toledo, looked matters over, returned to Wilmerding, and, before putting pencil to paper, worked out an improvement that would reduce the braking-distance to the required figure; that is, 1,200 feet from sixty miles per hour, instead of 1,780 feet; and in a week was back with equipment for the test-train.

Only the V.-P. Got Excited.

Being entirely certain that the new brake would do exactly what he wanted it to do, he sat quietly reading while the train made the first test stop. The vice-president and general manager of the air-brake company rushed in and, throwing his arms around Turner, asked:

"Do you know what distance we made that stop in?"

"Why, yes; I planned it to make the stop from sixty miles an hour in 1,176 feet; it couldn't do anything else."

"No; you're mistaken. The distance was 1,153 feet."

The New York subway was built to carry 400,000 passengers daily. When it was swamped with traffic the management planned to increase the maximum speed of express-trains from forty miles an hour to sixty miles, at a cost of $5,000,000, thinking thereby to increase capacity fifteen per cent.

Turner, who had been asked to attend a conference, said that, instead of increasing capacity, increased speed with so many stops so close together would actually result in a decrease of capacity; and was informed in so many words that he was a blanked fool.

Turner replied that he could increase the capacity of the subway fifty per cent, instead of fifteen per cent, and at a cost of $1,000,000 instead of $5,000,000. When asked how, he said he didn't know; and he didn't know, beyond the fact that he would do it with brakes and not by increasing speed.

But he worked the problem out in thirty minutes after he had obtained reluctant consent to try, telephoned his plan to Wilmerding, hurried to the works, where the castings, still hot, were being put in the machines by men with leathers to protect their hands, and had the new electro-pneumatic brakes, that by making quicker stops allowed the trains to run longer under full speed, at work in ten days instead of the two weeks he had promised, and ultimately increased the capacity of the subway nearly three hundred per cent instead of the fifty per cent he had promised.

Still that was not enough, so he was again sent for. This time he more than doubled the increased capacity by providing an automatic variable empty and load electropneumatic brake.

Passengers piling into the cars settle the car-body down on to the springs, and in doing so set the lever that utilizes the loaded car braking power. When they get off, the car-body rises and turns the lever to utilize the empty braking power.

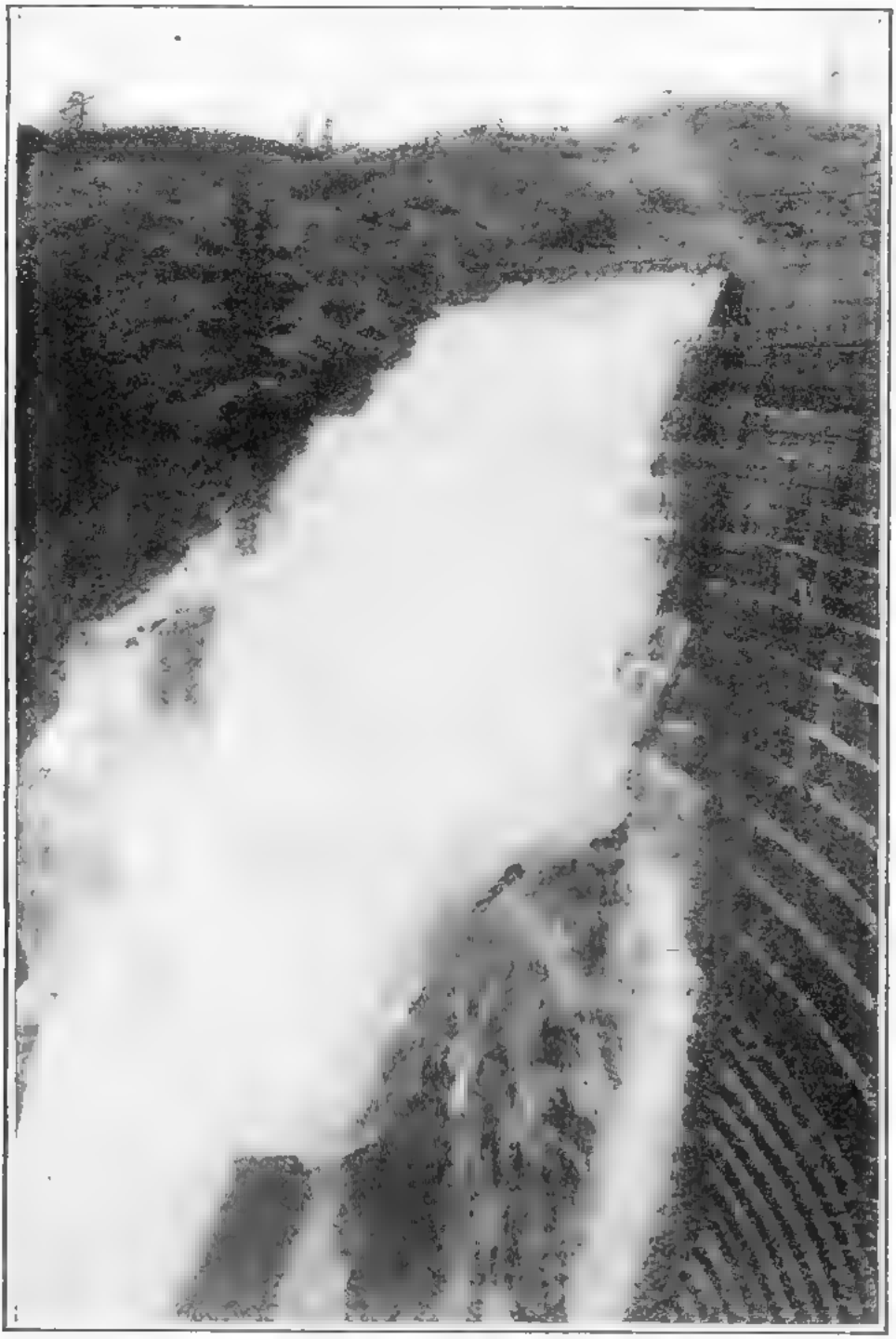
64 Functions with Only 5 Movements.

His latest device is the universal valve, for passenger service, designed to handle the heaviest and fastest trains at highest speeds, which performs sixty-four functions with only five movements of the engineer's valve. The Pennsylvania is to have all its passenger equipment provided with the universal valve by 1919 at a cost of $5,000,000.

Each year the Westinghouse Air-Brake Company places a large fund at Turner's disposal for experimental purposes. He has probably filed more applications for patent than any one else; and he has had upward of four hundred issued.

He signed five patent applications while I was waiting to see him one afternoon in June. Why, the Patent-Office at Washington has set aside a special section devoted exclusively to Turner.

Meanwhile Turner—who was only *loaned* to the Westinghouse people, you will remember—at this writing has overstayed his leave of absence from the Santa Fe thirteen years and eight months. The Santa Fe hopes, for Turner's sake, that it will not have to go after him; that's all.



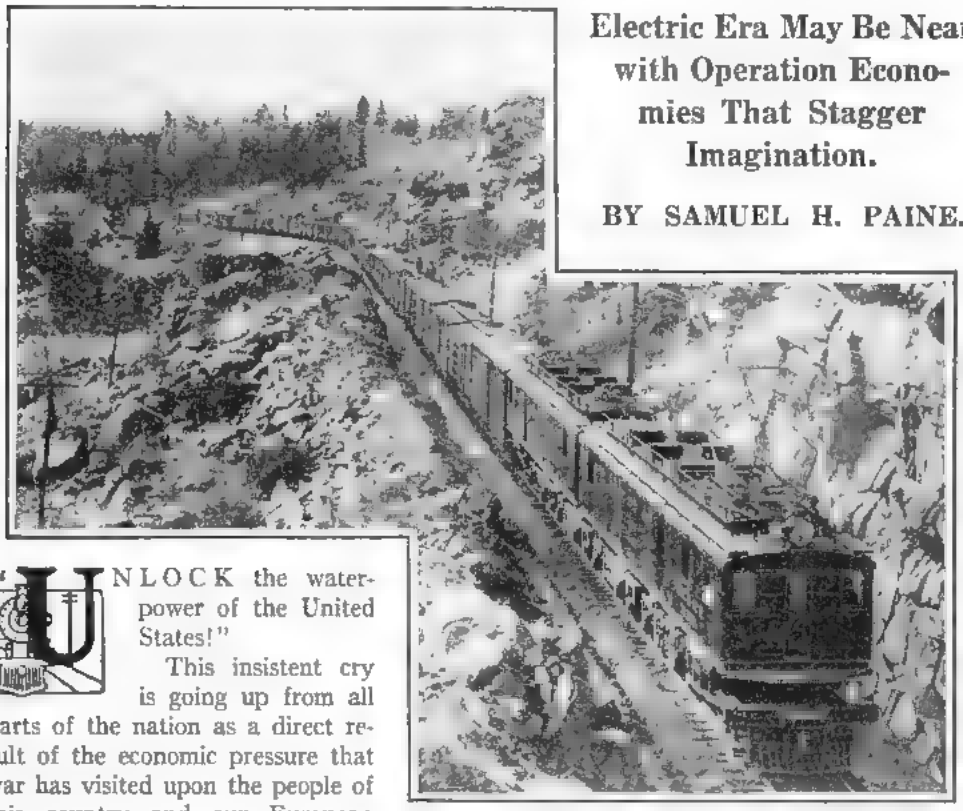
IN THE SPAULDING DAM AND SPILLWAY OF THE DRUM POWER DEVELOPMENT, STEPS AND HAND RAILS HAVE BEEN ERECTED TO RAISE THE DAM TO ITS FINAL HEIGHT POWER IS STEPPED UP FROM 6,600 TO 100,000 VOLTS AND TIED INTO THE OPEN TRANSMISSION LINES OF THE COMPANY

Photo by courtesy of Westinghouse Electric and Manufacturing Company

TAME WATER-POWER FOR RAILROADS!

Electric Era May Be Near with Operation Economies That Stagger Imagination.

BY SAMUEL H. PAINE.



A CHICAGO, MILWAUKEE AND ST PAUL 3,000 V D C ELECTRIFICATION FREIGHT TRAIN DESCENDING TWO PER CENT GRADE ON EASTERN SLOPE OF THE ROCKIES. "TAMED WATER" POWER HAS MADE THIS ELECTRIFICATION POSSIBLE

"UNLOCK the water-power of the United States!"

This insistent cry is going up from all parts of the nation as a direct result of the economic pressure that war has visited upon the people of this country and our European allies.

Behind all industry lies the mighty essential — power. The proponents of a general use of water-power declare that there is more than sufficient hydro-electric energy wasting in our hundreds and thousands of streams to turn every wheel of the nation, including railroad transportation, if it could be harnessed and applied.

They say that the government's conservation policy has outlived its usefulness, and now that almost one-half of the civilized world is looking with longing eyes upon our glittering store of material to serve the needs of mankind, it is appropriate that the conservation laws relax and that this tremendous water force be unlocked and its energy directed, in so far as that would be possible, to serve the common need.

From personal contact we have come to understand in this country what a voracious monster war is, though our early experience as a factor in the universal strife has pinched us very slightly in contrast with the dire privations that have for nearly two years afflicted all Europe.

Richly blessed though this country is with natural resources, a prolonged war will put it to a severe test. The world war Uncle Sam entered demanded far more from his wealth than his military strength.

Hence the whole nation is buzzing with reinvigorated commercial and industrial activity, and every man who produces an article of human necessity is in fact a soldier, battling for an international understanding which will make the world safe for all men.

The magic of power sustains all manufacture and all traffic; regulates production

at its source, and is second only to raw material as an element which fixes price. Coal, oil, and gas are the staples in the production of power.

However rich our soil with these commodities; the drain upon them has become so tremendous that economists reckon the day when they will no longer be so plentiful as to permit of absolute dependence by widening industry.

Only the future can tell what man's genius will bring forth in new forces to substitute for coal, oil, and gas power. Perhaps the day will come when some inspired soul will furnish a means of harnessing the tides, or will take power from the air, or draw from the moon magnetic forces to spin our clattering wheels.

But that is dreaming. What of the present—the here and now? What of power means easily within reach, and tested and tried?

The value of hydro-electric energy is no dream. It is precisely as practical to-day to run a fast train from power generated by the pressure of water on a turbine shaft as it is to steam a locomotive by shoveling anthracite under her boiler.

Meaning to Railroads.

The electrification of American railroads, although comparatively slow of progress, is nevertheless an insistent movement, and in view of the present agitation to open and further develop our wealth of water-powers, it is a timely subject for discussion.

Shall the railroads of the nation ever operate from power derived from waterfalls? It would require sublime faith in the genius of electric engineering to answer "Yes," but the dodo bird shakes his stupid head at strange sights and new sounds, and who wants to be a dodo?

Those who desire to look into the future and calculate upon potential wonders may best do so by reviewing the mechanical development of the past quarter of a century and taking the results as an evidence of what is to come.

The seeming impossible of a year ago to-day becomes a reality. Inventive minds oftentimes make impracticalities entirely practical.

The wizards of electrics, including the great Edison and Steinmetz, have delved deeply into the subject of means to overcome the resistance of copper wire and resultant waste in the transmission of electric power. They have not succeeded.

Electric power cannot be carried for great distances without enormous waste. But it can be carried two or three hundred miles or more in practical fashion. That is progress which presages more progress.

Substantial reasons exist for the belief that we are just at the dawn of an electric era in railroading.

Spectacular and important as have been the great electrifying operations at big city railroad terminals, the most significant and urgent evidence that the unseen current of power is to play a leading part in future transportation activities lies in the fact that where water-power abounds and electric energy is available at reasonable cost it has been applied and is to-day the agent of highly successful long-distance, scientific railroading.

950 Miles by Motors.

On the main line of the Chicago, Milwaukee and St. Paul Railroad, being the portion between Harlowton, Montana, and Avery, Idaho, 450 miles of track have for three years been successfully operated by electricity, and the remainder of the line to Seattle, a further distance of 500 miles, 950 miles in all, is being electrified.

Do you realize what this means to this railroad? Let me quote from the testimony of Mr. John D. Ryan, a director of the C., M. and St. P., and also president of the Montana Power Company, which will furnish the power, as he gave it before the Senate Public Land Committee at Washington:

"The railroad will pay under the contract for power delivered over 450 miles of its road something like $550,000 a year. It is paying now for coal to operate its steam trains over the same line approximately $1,750,000; and the company furnishes its own coal from mines on its own road, and one-third of its equipment is used in hauling coal to itself, whereas with electric power there is not any such waste."

That sort of talk makes you put on your thinking-cap, Mr. Railroad Man. Here we see a line cutting its fuel-bill to about one-third. The coal-bill of the American railroads is running at more than $250,000,000 annually. Save two-thirds of that for ten years, Mister Man, and you can redeem more than half of the amount subscribed for the first issue of Liberty Bonds.

It is worthy of note here that the Butte, Anaconda and Pacific Railroad is paying $96,000 for electric energy to operate eighty miles of road, as against a former cost of coal of $279,000, a saving of $174,000 per year.

Water-Power Lure.

Is it any wonder that the practical railroad eye is focused upon water-power as a means of locomotion? Coal prices are constantly increasing, and every additional locomotive put into use means the added average consumption of nearly two thousand tons of coal per year.

In fifteen years the American coal-bill has leaped $175,000,000 per annum. Beneath the curling waters of our streams there lies power enough to supplant all industrial as well as traffic requirements, if it could be applied. Water-power runs on forever, by night and day, independent of the hand of man and free of all costs save those incidental to the mere curbing of it.

In the States of Washington, Oregon, California, Idaho, Montana, Wyoming, North Dakota, South Dakota, Utah, Arizona, Colorado, and Nevada about 48,700 miles of railroad are now being operated by hydro-electric force. The total single-track mileage of the railroads of the country is 252,000.

It is common belief in railroad circles that in the near future a majority of the lines operating where hydro-electric power is available will adopt that energy. That they have not made greater progress in installing electric equipment during the past five or ten years has been due more to their inability to finance the turnover than to any doubt as to the practicability of hydro-electric power for railroads.

According to estimates, 10,000 horse-

DAM AND RESERVOIR OF THE ONEIDA DEVELOPMENT WHICH GENERATES 30,000 HORSE POWER

Photo by courtesy of the Westinghouse Electric and Manufacturing Company

power are needed to operate 100 miles of single track. Hence all of the railroads in the above-mentioned States would require for electrification 4,870,000 horse-power.

This would only be one-ninth of the hydro-electric energy possible to develop in the territory traversed by these railroads. It is readily seen that the railroads of the Pacific coast and Northwestern States may draw their full locomotive strength from the natural water-power, and still leave ample supply for other industries, such as the paper-making business and the manufacture of electrochemicals, explosives, metals, and such adaptable commodities, as well as pumping water to irrigate the 10,000,000 acres of arid lands located in the far Western States.

There are other advantages in electric installation on railroads besides the great economy in fuel. Electric operation eliminates the danger of forest fires.

This item may not be considered as very important by the Eastern railroad man, but the men who travel over western routes know the terrible menace of blazing trees and of the incalculable loss that lies in the dead and blackened acres that fringe thousands of miles of western and northern track.

Then, too, in this day of luxurious passenger travel, the item of noiseless, smokeless, dustless operation may be highly considered. In the mountain countries, where tunnels abound, the fact that the locomotive may create no gas to stifle passengers would be an added inducement to travel.

Relieves Coal-Carrying Equipment.

Motors replacing steam locomotives mean relief of the car-shortage problem, at present so stringent, in that cars now used for hauling railroad fuel may become available for general traffic. We have heard from Mr. Ryan that one-third of the equipment of the Chicago, Milwaukee and St. Paul Railroad was used in hauling coal to itself.

Fifty years ago the locomotives in use on our railroads burned wood and weighed 20 tons. The largest modern electric locomotive is 112 feet long and weighs 285 tons.

In many respects these motors are wonderful. They have the power of absorbing the mechanical energy of the train going down-grade by gravity and returning it in the form of electric energy to sub-stations for use by trains running along the level or going up-grade. Thus, through regenerative braking, as it is called, from 25 to 52 per cent of the power is recovered.

Gives Flexibility.

Another advantage is that the motor-propelled train has greater flexibility than that of steam-drawn trains. It costs the same to operate a steam locomotive, speaking generally, whether two or two dozen cars are attached to it. The cost of operating an electric engine, however, varies directly with the number of cars attached.

Professors Emory R. Johnson and Thurman W. Van Metre, in their excellent work "Principles of Railroad Transportation," have the following to say in regard to the advantages of electrification of railroads:

"On mountain grades the electric locomotive possesses the advantage of being able to exert its maximum power for an indefinite length of time, while the steam locomotive has difficulty in maintaining a maximum steam-pressure during a protracted period of heavy work.

"Another advantage resulting from the use of electricity in mountainous sections is that the length of summit-tunnels can be made greater, and thus the summit elevation of the line be made lower, than they might wisely be if steam locomotives were to be used in hauling trains.

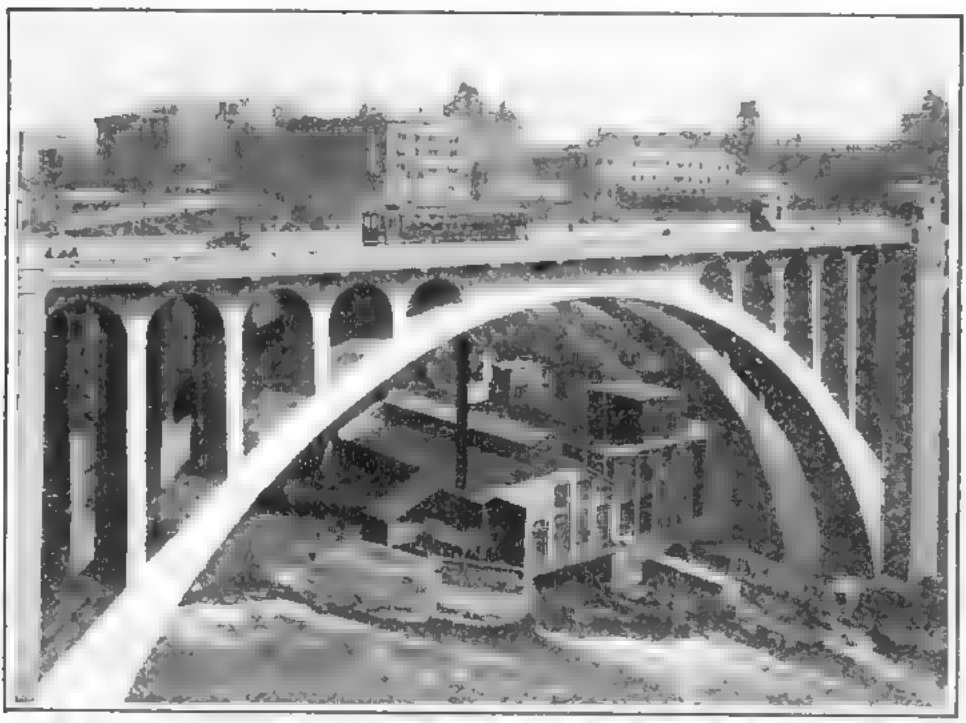
"Furthermore, the economy of electricity is much greater when it can be generated by water-power, and in mountainous regions ample water-power is usually available."

In addition to the use made of electric power on transcontinental lines, especially in the Rocky Mountain region and on the Pacific coast, several trunk-lines have adopted electric traction for local traffic in densely populated sections, leaving only through freight and passenger traffic to be hauled by steam-power.

Electric installation obtains on the Rochester branch of the Erie Railroad and the main line of the West Shore Railroad, between Utica and Syracuse, to meet local requirements; and the New York, New

THROUGHOUT THE WEST GREAT WATERFALLS WITH MIGHTY POWER ARE GOING TO WASTE. TWIN FALLS, SHOWN HERE, ARE PART OF THE SNAKE RIVER, IDAHO

Photo by courtesy of the Westinghouse Electric and Manufacturing Company



WHERE THE SPOKANE RIVER DROPS 1,200 FEET IN A DISTANCE OF 120 MILES, MAKING POSSIBLE THE GENERATION OF 400,000 H. P., OF WHICH 172,000 ARE DEVELOPED. ABOVE THE WATER IS THE SECOND LONGEST CONCRETE BRIDGE IN THE WORLD, SPANNING PART OF THE CITY OF SPOKANE

Haven and Hartford uses electric power for a considerable portion of its passenger service in various sections of the New England country.

Electric power has been used in the Baltimore and Ohio tunnels in the city of Baltimore since 1895. The electrification of the New York City terminals of the New York Central, New York, New Haven and Hartford, and the Pennsylvania railroads, and the Grand Trunk Railroad's tunnel under the Detroit River are so well known to the readers of this magazine that they need not be dealt with here.

It is true that they were expensive in installation, but they marked the pioneering stage of electric application and carried the inevitable expense of pioneering. They are costly to operate, but if their power could be drawn from natural waterfalls instead of coal-combustion, the cost would be cut from 50 to 75 per cent.

Water-Power Resources.

It is estimated that there are 60,700,000 horse-power in natural waterfalls in the United States.

By the way, do you know what "horse-power" means? Before the advent of steam-power, the horse represented to man the most powerful working force in universal use. And so, when engines came in, their power was estimated from the figurative power of the horse.

The meaning of one horse-power, as we speak of it to-day, is that it can lift 30,000 pounds one foot per minute. From this little reminder of the proportions of a horse-power you may have some conception of the gigantic force lying in the 60,700,000 horse-power that is available for hydro-electric development.

Of that great total, only 5,300,000 horse-power, or 8.8 per cent, has been opened to use to this date. Two-thirds of all our waterfall resources lie within the Pacific Coast States, but only 727,000 horse-power of that tremendous store has been developed.

There are about 65,000 locomotives in use in this country. Their rated horse-power exceeds the total fixed power of the country.

The coal that these locomotives burn in a year has been estimated at 121,000,000 tons. Allowing 26 tons per horse-power year—about 6 pounds per horse-power hour—the equivalent continuous output is 4,692,000 horse-power, or, with a 60 per cent load factor, 7,820,000 horse-power.

It is estimated that if all of the railroads of the country were to be electrified, the necessary installed power for their operation would be about equal to the latter figure. The fixed installation, it is estimated, would be about 120 horse-power per locomotive in service.

These figures indicate what a gigantic surplus there would be of hydro-electric energy if it were all available for use and were all available for railroad purposes.

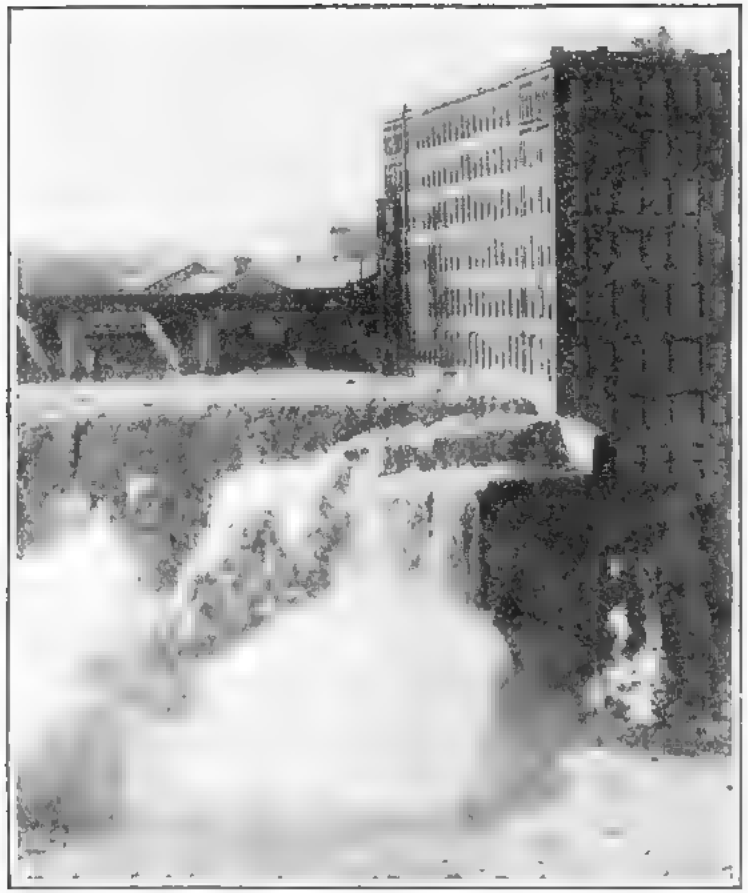
If there are 55,400,000 water horse-power undeveloped in the country, and if all of the railroad locomotives would require but 7,820,000 horse-power to operate, it would seem reasonable that the day might come, even if it does now seem remote, when this power will be transmitted over long distances and will play a vital part in railroad locomotion.

Charles W. Comstock, former State engineer of Colorado, to whom I am indebted for some of the foregoing estimates, in referring to the problem of making use of power over long distances, said:

"Seventy per cent of the possible water-power is in the western one-third of the country, with seven per cent of the people. No matter what the population may become numerically, it is probable that fully one-half will always, as now, live in the great Mississippi basin, for this is the region best adapted to the production of the staples of agriculture and animal husbandry.

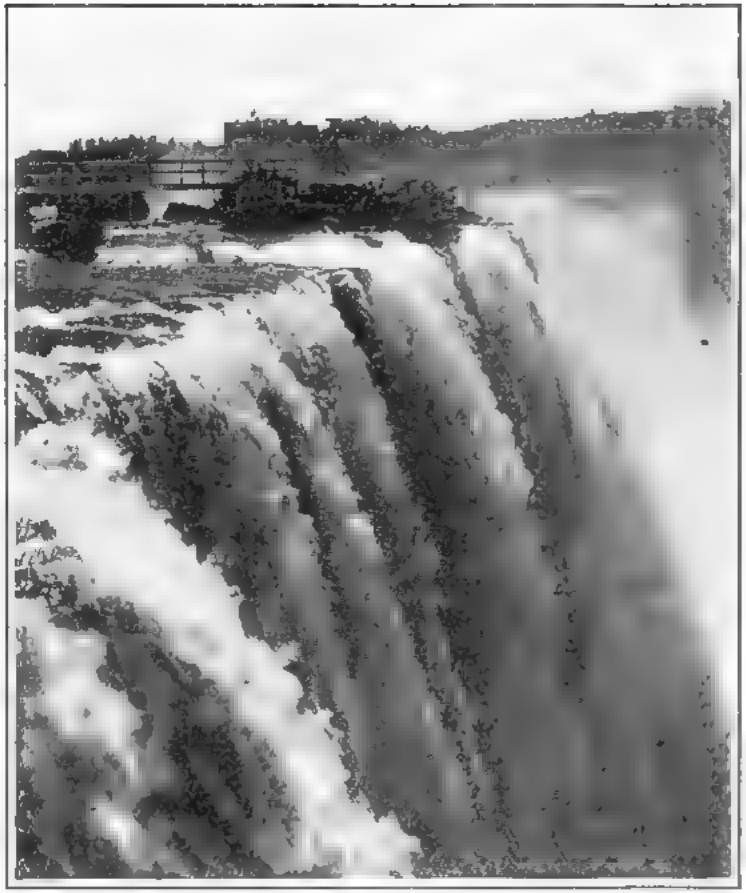
238-Mile Transmission.

"We are not justified in anticipating such improvement in the art of transmission as will permit the use along the Missouri River of power generated in the mountain and Pacific States. I do not know the longest transmission line now in operation—some one is always going his predecessors one better—but probably the 238-mile line of the Southern Sierras Company is the limit of present practise.



THE POTENTIALITIES OF "WHITE COAL" WHEN HARNESSED IN THE SERVICE OF CIVILIZATION ARE ENORMOUS. THIS WATERFALL, FOR EXAMPLE, RUNS THE STREET CARS OF ROCHESTER, NEW YORK

Photo by courtesy of Westinghouse Electric and Manufacturing Company.



MIGHTY NIAGARA HAS REACHED THE HIGHEST POINT IN WATER POWER DEVELOPMENT IN AMERICA. ITS GREAT RAPIDS SUPPLY MOTIVE POWER TO RAILWAYS, LIGHT CITIES AND OPERATE LARGE INDUSTRIAL MILLS

"Let us suppose that power might be transmitted 500 miles, with a reasonable loss. A belt 500 miles wide, with the summit of the Sierra Nevadas at its western limit, would have as its eastern boundary a line passing near Great Falls, Montana; Pocatello, Idaho, across the western edge of Great Salt Lake, crossing about the middle of the southern boundary of Utah, and near Gallup and Silver City, New Mexico. Clearly, no conceivable development in that belt of country would ever call for the use of 10,000,000 to 22,000,000 horse-power.

"What is to become of all this power if it shall ever be developed? The present fixed installed primary power of the United States, including steam locomotives, is between four-tenths and five-tenths of a horse-power per capita.

"On this basis the minimum potential water-power in the Pacific Coast States alone would provide for a population of 20,000,000 to 25,000,000 people west of Great Salt Lake.

"What would they do? They would be in much the same position as the Irishwoman and the Chinaman who were shipwrecked on a desert island—they made money doing each other's washing."

Crux of the Situation.

Mr. Comstock declares that we are not justified in anticipating long transmission of power without unreasonable loss, and yet he admits that "some one is always going his predecessor one better." Therein lies the crux of the situation as regards the application of hydro-electric force to American railroads.

If the water-powers had been distributed by nature in regulated location in each State, there would, of course, be no problem except that of financing the turnover from steam to electricity, assuming that the railroads posessed the rights or could economically purchase the power which independent companies would generate.

In lieu of such a perfect condition, railroad men base their hope for the electric era, first, upon the development of water-powers that may practically be applied to railroad service, and, second, upon the realization of the dream of inventors—long transmission.

If ingenious men are "going each other one better" all of the time in carrying electricity long distances, and if 238 miles have been compassed by one company, the prospect certainly cannot be called hopeless. On the contrary, it commands the attention of railroad builders, especially in view of the fact that the natural water-powers are largely held in reserve by the Federal and State governments, and present economic conditions focus attention upon them with a resultant popular demand that they be unlocked and set to work.

If there is a prospect that they may in the future be feasible for railroad application, the present might be a good time to develop them as far as possible for railroad service, with an eye single to the future.

As Mr. Comstock said:

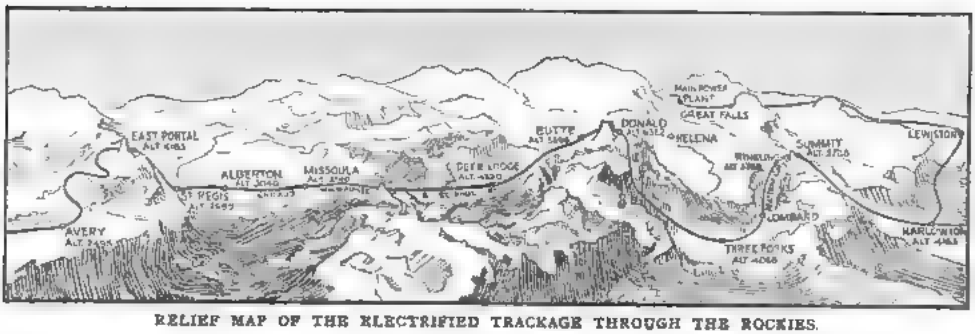
Power Development Has Always Trailed.

"Up to this time our power development has always followed a demand instead of creating it. This has not been true elsewhere, nor have we followed the same method in other activities.

"The Union Pacific Railroad would be nonexistent to-day if its promoters had waited for the Indians to petition Washington for improved transportation facilities. The coal-range would still be in universal use if the gas-range had not been put on the market until housewives clamored for it."

If the railroads of the country east of the Rocky Mountains ever do operate with hydro-electric power, it must come from the far West. Five great groups of States—the New England, the Middle Atlantic, the East North Central, the West North Central, and the West South Central—having in 1912 a population of 67,000,000, or 70 per cent of the total of the United States, have already installed a primary power equipment, water, steam, and gas, of 14,500,000 horse-power, or 171 per cent in excess of their estimated water-power resources.

The South Atlantic and the East South Central States have also exceeded their water-power resources. These figures indicate how idle is the dream that hydro-elec-



RELIEF MAP OF THE ELECTRIFIED TRACKAGE THROUGH THE ROCKIES.

tric power will supersede steam, unless it is transmitted thousands of miles.

The truth of the matter is, however, that water-power is being wasted in great quantities in the East, despite the fact that the natural resources do not measure up to power requirements. Take, for instance, Niagara Falls.

It is reliably stated that on the New York side of the mighty cataract, if full use were to be made of the waterfall available under our treaty with Canada, "it is possible to develop, in excess of the amount now being developed, at least four hundred thousand horse-power."

As the fixed installation for one locomotive is 120 horse-power, it is clear that if the full available power from Niagara were to be conserved and applied to railroads it would move more than 3,000 train-motors. Also, if it is possible to transmit power 238 miles on the Pacific Coast, it might be possible to transmit Niagara power to within seventy-five miles of New York, Philadelphia or Washington.

This is a side-light, to be sure, on the American habit of wasting natural resources. To make it more concrete, one should figure the value in dollars of 400,000 horse-power of hydro-electric energy.

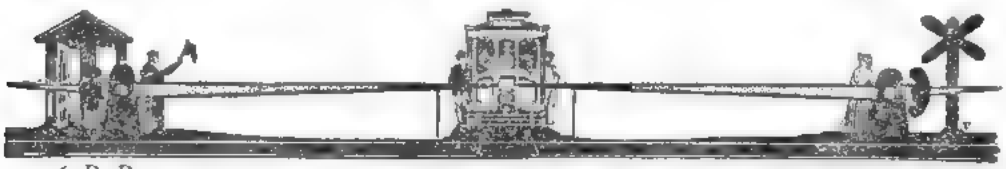
The production of one horse-power continuously for twenty-four hours throughout every day of the year requires the consumption of about twelve tons of coal per annum, even under the most approved modern appliances. Hence, to make 400,000 horse-power by coal would require nearly 5,000,000 tons per annum. How much is coal worth per ton to-day? If there is any railroad fortunate enough to be able to buy it at two dollars, the saving would be nothing to sniff at, even in this day of war loans figured in billions.

Congressman Charles B. Smith, of New York, says that the available undeveloped water horse-power in the United States represents a coal consumption of 300,000,000 tons per year. This is more than one-half of the entire annual coal consumption of this country at the present time.

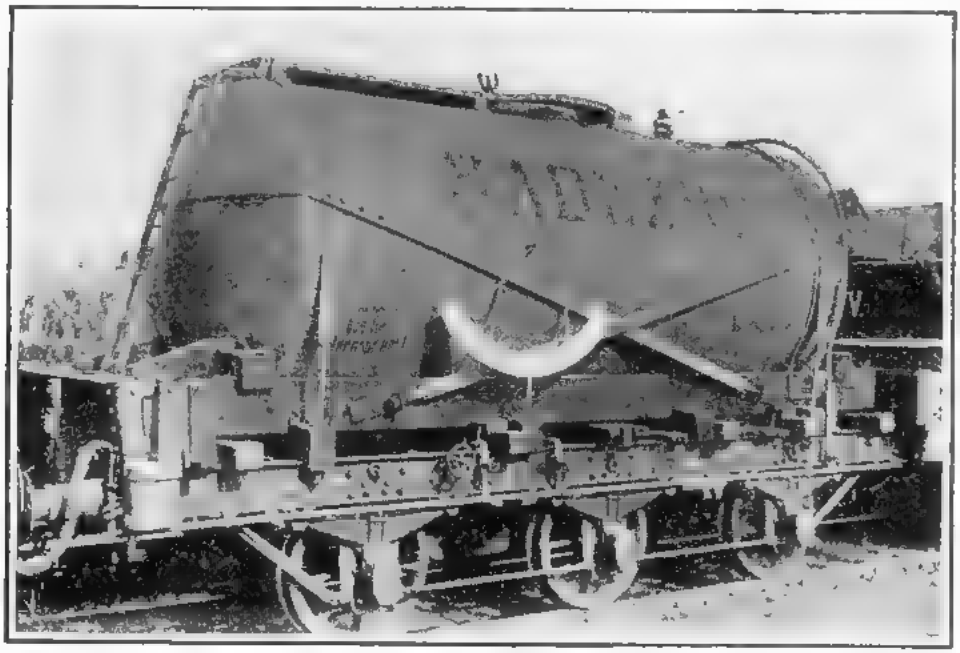
His figures are based upon minimum estimates. The maximum estimates show that coal might be done away with as a power factor if our water-powers were used to capacity and it were possible to transmit the current.

Hydro-electric railroad installation is a subject demanding the best thought of railroad men, however indefinite may be the time when it shall become a national possibility. Its advantages are too great, its economical need too urgent, to permit of its dismissal with a mere "can't."

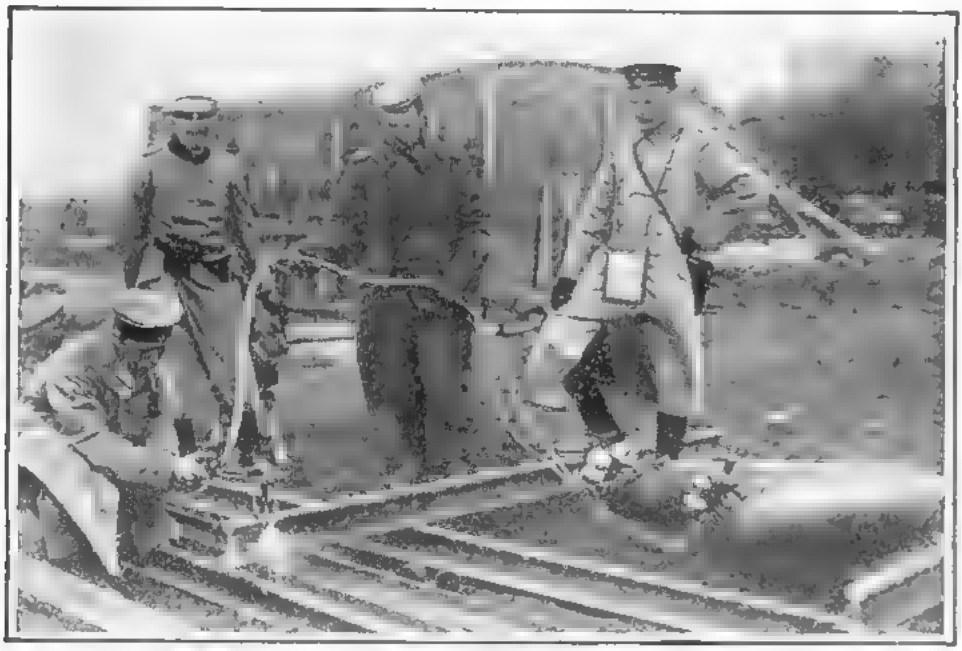
Before the boys of Eastern railroads apply for pensions, I dare say, Montana "juice" will be making car-wheels hum in Jersey. Call me a dreamer, if you will—wilder dreams have come true.



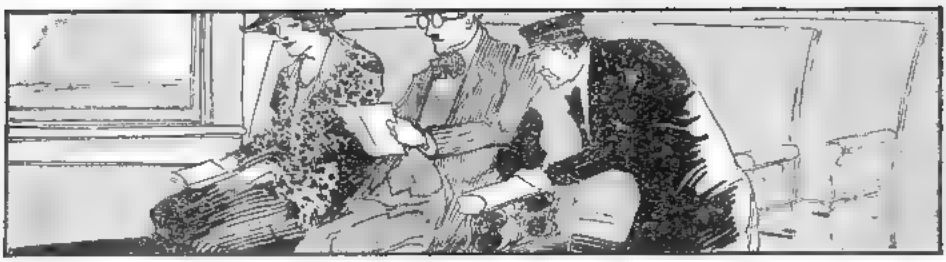
GERMAN EFFICIENCY ON WAR ROADS.



BOCHES GET THEIR SHOWERS REGULARLY ON TRAINS EQUIPPED WITH BATH-CARS WHICH ARE CARRIED ALONG TO THE FRONT. IN BOILERS OF THE TYPE SHOWN HERE THE WATER IS HEATED EN ROUTE.



AS SOON AS TERRITORY IS CONQUERED, TEUTONS BEGIN RAILROAD CONSTRUCTION. MODERN EQUIPMENT IS ALWAYS ON HAND FOR THE PURPOSE. RAILS ARE BEING CUT HERE WITH OXY ACETYLENE BLOW-PIPES.



"PLENTY OF SEATS UP FORWARD."

BY CHARLES L. FUNNELL.

"TOO much education of the fancy kind has a tendency to cloud speedy thinkin', like an economizer slows up a free-steamin' passenger engine," said Master Mechanic Mahoney, thoughtfully tapping the tobacco in his pipe-bowl with a burned match. Then he jammed the cover on his table d'hôte pail and lit up.

"You boys all know Jim Sears," he began, looking around the group that had dropped into Shop B for a social lunch-hour. Apparently Jim was known to those present, no one venturing to side-track a possible story by proclaiming the necessity of an introduction with the gentleman mentioned. Thus assured, Mahoney continued:

"He's the amen collector on the 6.09 out to Homedale, where I do my sleepin'. Jim lives in Homedale, too. Besides me and Jim and a few others, there's Miss Lane.

"But I was goin' to tell you about the gent with the fancy education that rides on the same run, education and all. His name is De Lancy, and he's admiral of a high-brow book-foundry in the city here.

"He used to live in town, but he told Jim he had removed his charms and chattels to the coy suburban dell in quest of that avocational relaxation which paints the richer hues in the dull canvas of man's daily toil.

"Jim thought he was recitin' poetry to him first, but then, when the old boy kept it up, Jim saw it was something the gent couldn't help. Jim thinks he was born that way, but I lay it all on his fancy education.

"Miss Lane happens to be De Lancy's stenographer. She lives in Homedale, too. Before De Lancy moved out on our division to get his 'avocational relaxation' Jim used to spend the time between stations in half of Miss Lane's seat that she wasn't usin'. She and Jim and I always rode in the last car.

"When De Lancy started commutin' he followed in after Miss Lane, havin' naturally come to the train with her from the office. It didn't put any nickel-plate on Jim's good nature to see them together all the way out, and after a week or two he began to show it.

"One night after we'd made four or five stops and the car had emptied out a little, Jim strolls down the aisle and stops next to De Lancy.

"'Plenty of seats up forward, if you prefer one all to yourself,' he says.

"'Ah, yes,' says De Lancy, 'one by one the peaceful hamlets call forth the recumbent occupants of the pallid plush, only to give them up again on the morrow, like streamlets feeding a mighty river.'

"That was too much for Jim, and he walks up the aisle to where Gassey Weaver was finishin' up the sportin' page. When he ain't readin' the sportin' page, Gassey is either sellin' life insurance for the Heavenly Mutual, or dreamin' about it.

"'Gassey,' says Jim, 'I got a book-carpenter back here that's causin' the income

tax commish to run ads for agile accountants in the want columns. I'm goin' to introduce him, 'cause you two have got so much in common. You ought to be real congenial like, both livin' out in the coy suburban dell like you do. Besides, Gassey, I don't think this guy carries anything in the Mutual.

"'Mr. De Lancy,' he says, with his best bow, 'Mr. De Lancy, there's a chap up in the aisle here who has heard a lot about you, and is very anxious to meet you. He has done considerable writing himself, along the lines of the vital questions of life, and you will find him an accomplished conversationalist. May I introduce you?'

"De Lancy started a spiel about how his heart went out to kindred souls, and by the time he had it all out he found himself shakin' hands with an oil burnin', force-draft life insurance agent, and Jim was doin' pretty well at keepin' Miss Lane from sufferin' melancholia over De Lancy's absence, judging by the giggles floatin' back to where I sat.

"It took Gassey three trips to sign De Lancy up, and so for three nights Jim had Miss Lane all to himself when he wasn't inducin' localized sheer failure in pasteboards or advertisin' the names of real estate developments vocally.

"On the fourth night the old type-herder was back on the job, spillin' his high-brow bunk to Miss Lane. Jim was ridin' with me a couple of seats back of 'em, and somehow he didn't seem to mind old De Lancey at all that night. Pretty soon that gent gets up and comes back to our seat.

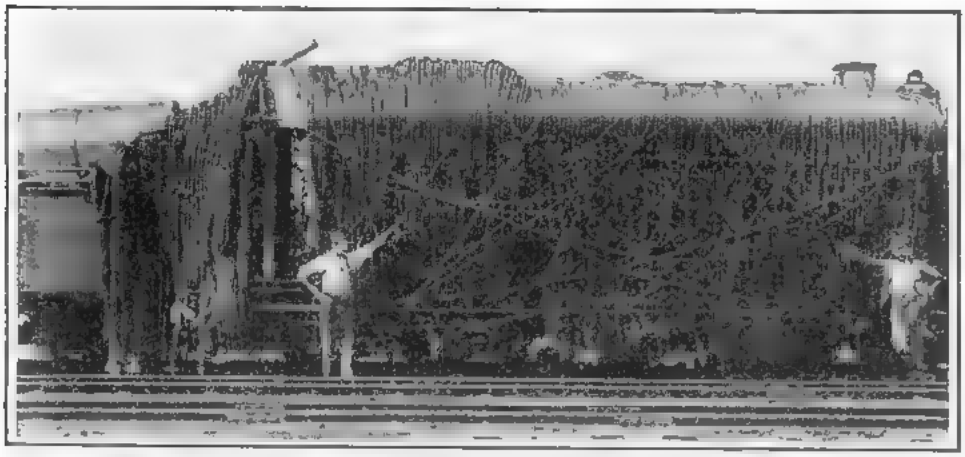
"'Sears,' he says, 'Miss Lane has informed me of her intention to sever connection with my office in her professional capacity. Upon my making inquiry into the causes, reasons and motives underlying her contemplated action, which comes as a great surprise to me, she laughed most charmingly, and referred me to you for the answer. You, I take it, have known the young lady for several years. May I inquire what, in your opinion, is the cause of her conduct?'

"'Me!' said Jim, kinder brief.

"'You! Can it be, sir, that you two have arrived at the fair realization that vibrations of your souls in unison is productive of those harmonics of symphony which lend their tremulous tones to the eager ear of sweet accord? Is it possible that, in gazing into each other's eyes, you have found the all-answering flash—the cosmic wireless perfectly attuned, and your dual entities have merged upon the astral plane as one?'

"'Aw, tripe, no!' says Jim. 'I just love the girl.'"

WRAPPING THE SHELL-CAR IN ROPE.



AN ENGLISH ARMORED CAR IN THE SOUTH AFRICAN SERVICE COVERED WITH A BLANKET OF HEAVY ROPE TO PROTECT ITS EXPLOSIVE CONSIST.

MENTAL SEMAPHORE MAKES OR MARS.

A Bunch of Anecdotes to Show That Railroad Machinery Can't Be Blamed if the Human Board Fails to Work.

BY FRANK KAVANAUGH.

A BRAKEMAN ran along in front of his train to head it into a siding. He ran ahead so that the train would not have to be brought to a standstill. This was important, because only the first two cars were equipped with air-brakes. Air was in its infancy then.

The evening before the brakeman had called on a young lady of his acquaintance —a high-school miss. Her father had told the brakeman to get out and never, under pain of boot-toe where it would do the most good, come to see his daughter again.

Had His Mind On the Girl.

The brakeman was thinking of all this as he ran for the switch. It was one of the three-throw kind, now obsolete.

Instead of the brakeman's keeping his mind on his work, it was on the girl and her father; so he threw the switch the wrong way, and the engine and six cars piled up in a barrow-pit at the end of a short stub-track.

This is a true story, for the writer was the brakeman, and the road the Texas and Pacific, and the siding at a station called Windom.

Never again did the writer brake on the Tee Pee. He didn't even ask for a clearance after Sam Martin, yardmaster at Bonham, got through telling him where he would land if he didn't keep his mind on what he was doing.

The girl afterward married a policeman, and lived happy ever after; but in her 'teens she was the innocent cause of one of the worst pile-ups on the Transcontinental Division. And it wasn't the fault of any safety devices; the human semaphore failed to fail.

Monkeyed With the Morse.

We had waited at Tioga, Texas, on the joint track of the Missouri, Kansas and Texas and the Texas and Pacific Railroads from Whitesboro to Fort Worth, half an hour for orders. We were but one of the fifty or sixty trains a day the despatchers had to handle over that little piece of single-track road, and it was often necessary to lay out some of the slower trains for a few minutes. We were a slow train—a local freight.

The operator and the writer were skylarking. At that time the writer could take a train-order very easily, and liked to show the newly acquired knowledge.

Got Funny With the Telegraph.

So when the despatcher called Tioga and the operator began taking the order, I repeated each word as it came over the wire for the benefit of Johnny Ford, the conductor, and the engineer, who were also in the office:

"No. 106, Eng. 123, will wait at Tioga until 10.25 for 1st 33, Eng. 212."

The despatcher afterward declared he couldn't account for the fact that he did not detect the error when the message was repeated. But he didn't. Another personal semaphore that failed to work.

Ford and his engineer looked at their watches simultaneously.

"Let us out, kid," said the latter, and I ran for the switch.

We were half-way out on to the main

line when the 212—at that time one of the largest engines on the Tee Pee—poked her nose around a sharp curve just below the switch. Two pilots and headlights smashed, an operator discharged, and a brakeman—me—given a jacking up was the result.

The order should have read "10.45." The operator had followed my reading of the message instead of paying strict attention to what the sounder said.

The operator went home, studied agriculture, and now owns half a Texas county; so perhaps he is not sorry I caused the loss of his position on the "joint track."

Car of Hogs Checked Over.

Early this year a Kansas farmer shipped a carload of hogs to Chicago. Somewhere between the two big rivers the car was "ditched," and the hogs, while they were not injured, escaped.

A claim-agent, knowing that it would have to come away sooner or later, paid for the hogs then and there.

Most claim-agents would have stopped at this point, but this one was conscientious. He made an offer of one dollar a head for any of the hogs delivered to him at a station close to the wreck.

The idlers watching the process of clearing the wreck left immediately in search of hogs. The claim-agent at the station with an empty car, began to receive hogs and pay out dollars. When the car was full and night was coming on, the car was sealed, and the next through freight took it to Chicago.

The following afternoon he received this message from the company representative to whom he had consigned the hogs:

> Car of hogs checked eight over. Pls. explain.

All hogs looked alike to the claim-agent. A search of the hog-pens in the vicinity of the wreck proved the ownership of the eight over hogs, and their owners duly received checks in full.

Here's One from Mexico.

With the introduction a few years ago of native firemen and brakemen on the Mexican Central Railroad, the Americans remaining there were "on their nerves" all the time for fear the mistake of one of the students would cause serious trouble.

About the worst thing that happened was to an American conductor who was a stickler for the book of rules. Although he is out of the business now, they still tell the story in El Paso switch-shanties:

An engine took a train into Chihuahua and was headed back as the first section of a passenger-train. At the first telegraph-station out, the second section was annulled, the passenger having been delayed by a washout on a lower division.

The engineer could speak no Spanish, but he pointed to the light on the engine just to the right of the front end, and indicated by signs that the Mexican fireman take it in.

The Mexican went out on the running-board and got the lamp. Then he went around the front end, and the engineer, seeing him do so, naturally concluded he had also taken in the left-hand lamp at the same time.

At the next siding they met an extra freight, waiting for the passenger. Seeing the light on the fireman's side, indicating a train following, the freight waited where it was.

Walked 18 Miles for Orders.

The nearest telegraph-station was eighteen miles away. After waiting several hours, the conductor, fearing to trust one of his brakemen with the mission, put the train into the engineer's charge, and began the walk

Darkness overtook him. Coyotes, with the instinct they have of knowing an unarmed man, came dangerously near the walker—and howled. The rear brakeman had neglected to fill the lantern, and it flickered and went out.

Once he sat on what he thought was a perfectly clean tie to rest. There was a vine of nettles growing over it. They penetrated portions of his anatomy. Once he stumbled and fell, cutting a gash just over his left eye.

At midnight he reached the telegraph-office. It was in darkness, being only a day office.

At one house of the group composing the village he attempted to awaken the inmates by knocking. Some one inside shot through a window, narrowly missing the conductor's head.

While he was pondering over what to do next, a train whistled and, before he could reach the tracks, rushed by. It was the belated passenger-train.

Two or three hours later his own extra-train came in and found him in the station asleep. He had kicked in a window to enter.

A physician at Chihuahua took five or six stitches in the cut in his head, fixed him up otherwise; those Mexican nettles have a habit of entering the skin and festering. There is a business man in El Paso to-day —a former M. C. conductor—who uses strong language whenever you mention native crews to him.

Again the personal semaphore. The fireman neglected the second lamp.

The Man Who Took No Chances.

The Lord may love a cheerful giver, but not with half the love, I'll warrant, that a train-despatcher loves a crew who will "help themselves over the road." That is, run close to a superior train so as to make a siding before it, where there is no risk.

The higher-class train may be laid out a few seconds, but what of it? A passenger engineer stands a better chance of making up time than a freight man. A crew that will fudge a little and not go into danger is the sort of a crew the despatcher blesses.

He's off the road entirely now, pensioned; but Smitty, as we called him, was the very antithesis of a self-helper. If he had a time-order giving him twenty minutes to get to a siding for a superior train, nineteen times out of twenty he would stay where he was rather than risk laying out the other train a minute.

Once when a spring-hanger broke, Smitty drifted down a grade to a siding, and then ran like sixty to let himself in the "hole" rather than block up the box where he was and lay out a red-ball freight ten minutes. He was one of the best engineers on the Oklahoma Division, however.

"I'm on the safe side first," he said to me a dozen times when I joked him about his facility for getting laid out. "When you despatchers think you can get me to run on a time-order and get into the clear by the skin of my teeth, you've got another think coming."

At the upper end of the Oklahoma Division the lines from St. Louis and Kansas intersected. Two fast passenger-trains reach the junction within twenty minutes of each other, and run at that interval for sixty-five miles to the division point, where they are switched.

It was dull summer, and the road had cut off half the night operators along the division. On that sixty-five miles we could call just three intermediate stations after 6 P.M.

Smitty was at the junction, first out. Word came that there were ten cars of "red-ball" (penalty freight) due to arrive there just before the passenger-trains.

I sent Smitty a personal message something like this:

> Try to get that red-ball through without getting in the hole for every hand-car on the division. There's nothing against you to-night but regulars. Make time.

"What did he say when you gave him the message?" I asked the operator at the junction.

Deleted by the Censor.

"See recent-order against profanity," replied the operator. "That is why I can't tell you what he said."

"31 then," I said:

> C&E Ex. Eng 1264.
> Ex. Eng. 1264 will run extra A—— to S——, avoiding regular trains.

Ten minutes later the extra was reported out, and the fast passenger-train two minutes after.

The passengers and extra were all I had on that end that night. The first passenger was OSed out of V—— half an hour later and a few minutes after the second passenger.

"Confound that careful man!" I exclaimed to myself. "He took the hole for both passengers at that blind siding above V——, and if he can't head out, it will

stick him there for the local—one hour and twenty minutes."

At C—— the same OSes of the passengers. There they met a local eastbound.

The local got in there just as the first passenger was pulling out, pulled up to the station along the siding, loaded and unloaded baggage and passengers, and then pulled up to the far end of the passing-track to meet the second train

"St. Louis must be shipping all her booze," remarked the C—— operator as he OSed the first passenger.

"Why?" I asked.

"Never saw her pull refrigerators before," he replied.

"Perhaps you'd better wash those windows in the freight depot," I told him. "You can't see what's passing."

The real surprise came when the first passenger arrived at T——, its first stop since leaving the junction with the exception of one for a crossing near V——.

The operator OSed the first passenger, then without breaking OSed Extra 1264. And as he did so he sent me the following personal message, "Thrown off by engineer of 1264," he said, "as he went by on the passing-track ":

> JY, S——: Have yard switches lined up. Am coming in ahead of 22. She can't run fast enough. Had my nose in her Pullmans all night. That's why I had to douse headlight in passing telegraph-stations.

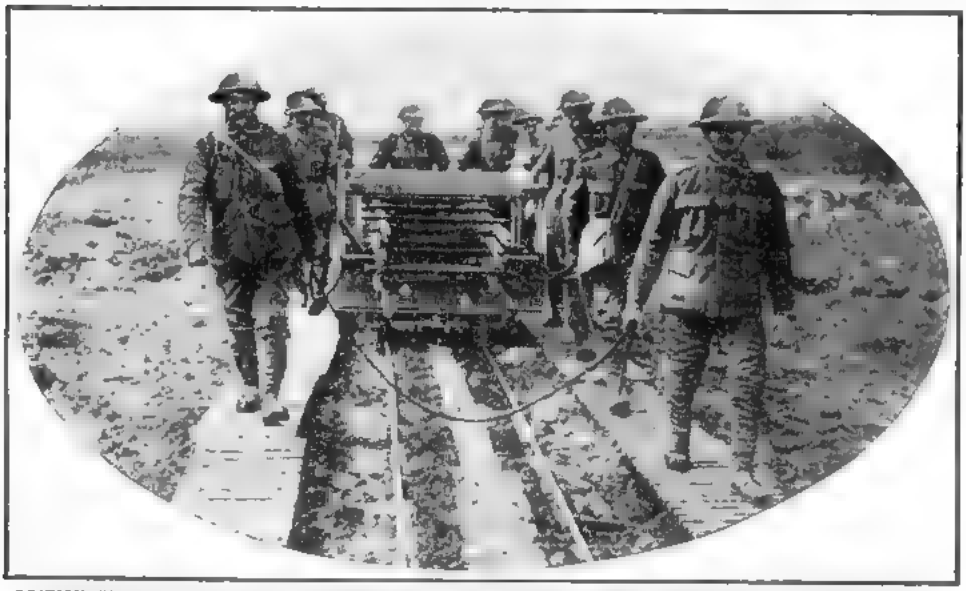
The 1264 showed her headlight just about the time I had phoned the yard-office and had the switches lined up and a crew called to take the red-ball cars on to Oklahoma City. When the hostler took the engine, Smitty, black of face and white of teeth, burst into the office.

"There's your red-ball loads!" he exploded. "Now, if I ever hear a certain despatcher say anything about me being afraid again, I'm going to pay a fine for licking him. Get me?"

With that he turned and walked out. I watched through the window until I saw him walk jauntily into the station eating-house and swing astride a stool. He had come over the division between two of our fastest passenger-trains.

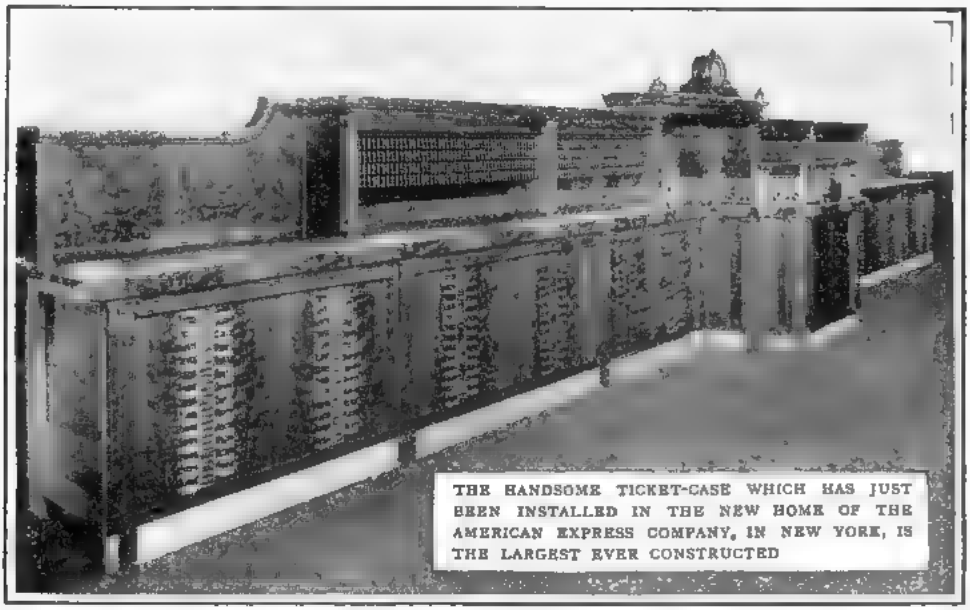
The mental semaphore has a great deal to do with railroading—successfully and otherwise.

TOMMIES TOTE THEIR OWN RAILWAYS.



BRITISH SOLDIERS LAYING A LIGHT TRACK AS THEY GO IN GROUND SO SOGGY THAT BOARDWALKS HAVE TO BE BUILT FOR THE MEN TO WALK ON.

A TICKET-CASE THAT DWARFS 'EM ALL.



THE HANDSOME TICKET-CASE WHICH HAS JUST BEEN INSTALLED IN THE NEW HOME OF THE AMERICAN EXPRESS COMPANY, IN NEW YORK, IS THE LARGEST EVER CONSTRUCTED

INTRODUCING the biggest ticket-case in the world!

When the American Express Company opened the doors of its new home in New York recently, the traveling public got its first glimpse of the enormous and beautifully finished cabinet which will hold more coupons than any ever before built.

Five full-grown men and a boy could lie end on end along the counter of the giant case, which measures 35 feet 5 inches in length. There are two main divisions, the lower section with a capacity of 2,484 coupon forms, and the upper, which contains 688 tubes. Besides these, there is a compartment at either end for 316 rubber destination stamps. Built in the center of the case is the cashier's cage.

The lower portion is divided into seven compartments, six of them being provided with coupon drawers. Each compartment is covered with a spring friction roller curtain which can be lowered at night and locked.

An invisible door is formed by the front of the cashier's cage. Inside are cash-drawers lined with interchangeable metal, and a cash-pit at either side.

Tubes for local tickets of standard type are kept in the upper part of the case, which is fitted with lights that reflect on the working ledge. Constructed of selected American walnut, the veneered parts of this handsome cabinet are beautifully matched throughout, the drawer fronts being veneered vertically, to resemble one piece of wood.

The coupon ticket drawers are a series of metal channels securely fastened into a wooden frame, each being equipped with a portable friction follower. This is adjustable front to back, for the regulation of the various lengths of tickets.

9,718 Separate Pieces Used.

All the drawers are composed of series of seven and nine channels, and across the front of each is a metal strip which allows for the proper labeling of the tickets in each compartment. Each drawer, also, is provided with a number-plate and pull, and operates on metal runners.

In the construction of the case there were used 6,344 pieces of metal, each of which passed through from fifteen to eighteen operations, making a total of 114,192 operations. The number of pieces of wood used was 3,374.

TRIPPING DOWN THE OLD MISSISSIP'.

BY RAYMOND S. SPEARS.

The Disappearance of Jerry Fander Stirs Up Excitement in Pittsburgh and Points South.

A SIX-PART STORY—PART THREE.

SYNOPSIS OF PREVIOUS CHAPTERS.

JERRY FANDER, of Pittsburgh, orphaned heir to millions, takes a motor-boat trip down the Miss.ss.ppi, in the course of which he proves of service to Tressy Wooten, a shanty-boat girl. He is kidnaped by Dan Delp and Chub Mildy, river rats, who also steal his boat, the Fairy Land. Fander makes a deal with the rats, whereby he is to get one hundred thousand dollars' ransom from the miserly administrators of his father's estate. Of this sum the kidnapers are to get sixty thousand dollars and he is to keep forty thousand. If the administrators won't give up, the rats threaten to kill young Fander.

The trustees are using the Fander estate to develop the Swamp, Delta and Bayou Railroad to their profit, and naturally don't want the heir around. They put out the story that Jerry is serving a jail term under an *alias*, offer a reward to any one who can locate him, and hire Detective Shadder to engage in an ostentatious chase. Fred Walts, a Pittsburgh reporter, writes a newspaper story which gives an inkling of what the trustees are up to.

CHAPTER XII.

JERRY SEES MATTERS IN A NEW LIGHT.

JERRY FANDER did not find the days in captivity on his boat, the Fairy Land, at all irksome. Long as the hours were, the novelty and peril of his situation kept his time from growing tedious.

His captors were well satisfied with his plans. They recognized the fact that these plans could not work out in a hurry; that they must wait for developments.

They kept Jerry supplied with the newspapers as he desired. That was not difficult, for by sending to Arkansas City they obtained most of the important newspapers of the Mississippi Valley, and a subscription for two Pittsburgh papers brought the news straight from home.

The subscription for the papers brought the story of the lost young man from the beginning, and Jerry found his cheeks growing warm as he read the account of one of the reporters. The other news story was clean and fair to him.

Then the Sunday paper containing the story of the work done by the Fander estate and Jerry Fander's own light experiences, arranged chronologically, brought a grim fact home to Jerry. The things that he had thought were just "good times," did not sound so good when they were compared with the serious matter of the great estate.

In that long article, however, there was a good deal of space about the Swamp, Delta and Bayou Railroad. The reporter had put a question-mark on the matter of whether the Fander estate was back of this huge speculation?

Jerry recalled hearing something about that railroad the last time he was home. It had cropped up among some papers which he had glanced at in view of the provision in his father's will that he should be kept informed regarding the estate.

Those quarterly reports on the Fander estate had been a great bore to Jerry Fander. He had not tried to make line or leader of them. But he had observed that in the report there was mention of the Swamp, Delta and Bayou Railroad. The remark was to the effect that a certain surety had been taken, or given, with bond attachments, and as his eye rested on the brief item, Bough, who had explained the questions to him, said:

"That's a little tap-line matter—doesn't amount to anything. Now here's the real estate."

"Not amount to anything!"

Jerry read the long question raised in the Sunday story, the subject of whether the Fander estate was involved in that railroad, which promised to be such a profitable venture for the promoters, Messrs. Faul, Kulle and Bough.

It was Bough's manner, rather than what he had said. Jerry, through the corner of his eye, had caught an expression on Bough's face, a sharp eagerness and haste.

Jerry had not thought about it at the time. Now he recalled it.

He recalled it because he was engaged in a game which was more serious than anything he had ever played before. More and more he felt that the two river pirates would kill him if he did not find some way of extorting the ransom for them.

Those executors would not let the money go, even to save the life of the owner!

It was, of course, a preposterous thing. Yet the story of the search being made to find him showed the true condition of affairs.

They were telling the newspapers all about it. They left the letter unanswered. They insinuated in the newspapers that Jerry was caught in some deviltry, and that he was in jail under an assumed name.

That was part of Jerry's game. He had deliberately insinuated as much. If they had cared for him they would not have spread the matter in all the newspapers.

But not caring for him, they let the world know that the young man was caught at last, and that he would be given a perfectly fair trial.

In some of the newspapers Jerry found wise editorials praising the executors who had been stirred to a sense of decency, and would not use the millions to save a young man of wayward life from the consequences of his free and reckless manner of living.

Jerry flushed unhappily when he recalled how he had wasted his time, but he was indignant at the insinuations that he had violated most of the statutes and all of the moral code. He had not done that. He was quite clean.

He had romped and roamed around, but his allowance of $8,000 a year did not permit the lurid extravagances which allowances several times that large allowed less restricted youths.

"They've just let me be classed in with the wild ones," Jerry said. "They know better, too. They know where all my money went to, and they've seen the bills and statements and vouchers."

Jerry Fander had kept a quite close account of his own personal affairs. It came natural to him to do so. He had spent his money, but not meanly nor extravagantly—just for running around and healthy play, mountain-climbing, running an automobile, dressing pretty well, and living pretty well.

Many and many a man had spent less money worse than Jerry did, doing more foolishness with it.

Yet, knowing these things, the executors of his father's estate had let the report go around that he had been caught in crimes, and was somewhere in jail. They had turned it over to the newspapers the first day.

They had made no investigation of any kind. They had had no time to investigate.

Jerry Fander had tried them and found out just what kind of people they were. He began to realize that there was a great deal more in the matter than a mere kidnaping and getting out of his predicament.

"They're just thieves, trying to hang fast to father's estate," Jerry surmised to himself. "And he trusted them, and I've trusted them, and begged them for extras. They think they can hold me up that way? They've a lesson coming, now that I'm onto their game!"

Looking back through his memory he could see how the executors had kept shunting him away from serious affairs. They had kept him abroad, studying art, literature, culture, and nonsense.

They had never given him the least help in business affairs. But they had held him and trimmed him too close. He had not had quite enough money to make a splurge.

He could do no more than live well on his eight thousand dollars. He had been forced to economies. The economies had awakened a kind of sense in him which had long been dormant.

Now this sense came welling up in its growing powers. He had tested it when he talked to his captors about how much money they would need to make them perfectly happy.

He had seen a clever little scheme to catch a little of the rake-off for himself. Then, when he came to plan the whole affair for the two kidnapers, he found his mind grasping details, seizing essentials and formulating plans whose intricacies were like a plot in a play or a novel. He realized that it was from such plans that great business reaches its heights of success.

He was playing his wits against hard-headed executors, to earn a hundred thousand dollars. It was business—romantic and unbelievable business; and yet that was what it was.

His native caution had saved him from playing into the hands of the executors who had no liking for him—for whom he had come to have an unvoiced, unrecognized suspicion. Now he had seen and acted upon the questions in his own mind.

"They've got a day of reckoning coming, letting me stay here to be killed, rather than save me with a hundred thousand of my own money!" Jerry told himself under his breath. "But they'll come across at the proper time! Yes they will!

"They tumbled into my trap good and proper. They thought they'd find me all tied up with criminal charges against me, and they blabbed—told all the papers what they suspected!

"If I'm not fit to take care of the fortune, if I have not shown reasonable business acumen, in the discretion of the executors, they can keep the estate.

"They've got me going bad, and they're happy over it! That'll tickle them, having me in for hanging! We'll see, we will!"

Jerry rattled his chains, and his captors kept their eyes on him. He had easily persuaded them that it would take a month or two to work out the idea which he had outlined to them.

They were willing to wait. They had everything to gain and nothing to lose. They had hidden themselves perfectly. They had even made their security doubly sure by the simple plan of running their own motor-boat into an adjoining bayou arm, so that a few rotten and half-submerged logs floated into the bayou where the Fairy Land was moored would make it look as though it were not navigable—were jammed with drift.

By walking two hundred yards through the brake they could reach their own boat and come and go as they pleased, and yet any one following them in or out could never discover the whereabouts of the Fairy Land, and their own disguise of hunters and trappers covered their work completely.

They took turns running out after the mail every three or four days. They took turns hunting, fishing, setting a few traps. But all the time they kept one man watching Jerry night and day.

But close as they watched him they failed to discover the paper-thin, rough-edged nail-file with which, little by little, while waiting for his other plans to come to a head, he cut a slit into one of the links of the handcuff chain that held him a prisoner. He kept the cut filled with bread crumbs, blackened with ink.

The pirates would sit and talk for hours with Jerry while waiting for their plot to ripen. They told him of the life on the Mississippi, things which he could believe now that he was a part of it.

They took him frankly into the secrets of some of their old exploits, not telling him where they were committed, but he knew that they must be telling the truth.

"One time me 'n' Chub was drappin' down the Ohio," Dan grinned one evening, "an' we hearn a bell ringin' an' a lot of cheerin' an' a band playin' up in a little town they was theh. We hadn't no use fo' that town. They'd fine yo' ten dollars if yo' was blowed in by a wind, an' twenty dollars if they seen yo' had that much.

"Well, we scouted around an' found out about hit. They'd jes' put in a new brass an' composition bell, on the town hall. Hit weighed six hundred pounds, an' yo' nevch hearn a sweeter sound in yo' life than that bell.

"Me 'n' Chub was broke. We hadn't nothin' but muskrats we'd snared up creeks to eat, an' we was jes' desp'rit. So we went to a feller up-town theh, who kept a big store an' was sore 'cause they'd put in anotheh feller for village president 'stead of him, an' that feller had put in the bell—kind of a fire-alarm an' curfew an' so on. Well, we told 'im the bell on the town hall was fo' sale fo' twenty-five dollars. He tumbled, an' 'lowed he'd buy hit.

"So Chub an' me took out the clapper, harnessed the bell off the roof an' push-carted hit down the riveh, an' buried hit in the creek-bank. I neveh sweat no harder'n I did that night."

"Ner I!" Chub grinned.

"Well, that feller was theh with the twenty-five dollars, all right. He he'ped fill up the hole, too, on the bell. Then I went an' seen the village president next night, an' asted him did he want to know real hard who'd swiped that bell?

"They'd offered fifty dollars reward, an' he 'lowed he'd split with us, an' we done hit, took him down an' showed him the hole the bell was buried in. We told him we'd see three fellers with a push-cart come down the night befo', and they was met by another feller.

"We told how we'd scouted aroun', wonderin' what was up, and then had follered the fourth man up town an' seen him go into a house theh. When we told wheh that house was, the village president kind of whistled through his teeth—ho law! He pulled forty plunks into fo'r eagles an' paid us."

"'Yo' shore done me a favor, comin' to me!' he said. 'Yas, suh'"

"So me 'n' Chub come on down the riveh, same 's we'd be'n comin'."

"Then what happened in that town?" Jerry asked eagerly

"Quite a lot. Me 'n' Chub writ to fo'-five preachers an' deacons an' them kind, an' said them politicians had the bell buried down by the creek. They organized a vigilance committee, an' ketched 'em both jawin' theh by the bell, 'rested 'em, and I neveh did git to know what happened.

"They was lawin' hit, last I hearn tell—village president, politicians, an' the whole darned town. Dadblast them towns that always rakes off a strangeh!"

Compared to the lives of the two river men, Jerry felt that he had never lived. They had ridden through cyclones, escaped from jails, robbed country commissaries, scouted out in swamps with bloodhounds on their trail—they carried little oil-cloth bags full of red pepper all the while'

They had been caught in a great sleet-storm and had their shanty-boat capsized by the weight of the ice on the cabin. They had started down the river in a twenty dollar skiff once, hunting and trapping—"honest!"

But they came into New Orleans with a thousand-dollar houseboat and gambling equipment.

They had tried whisky-boating, but found themselves to be "their own best customers," so they quit that and went to junking—gathering medicine bottles, old brass and copper and rubber.

"Now we took to kidnapin' fo' a change," Dan remarked grimly one night, and laughed when Jerry had to laugh

They became good friends. That was what Jerry could not understand about the matter. The cold-blooded scoundrels were perfectly amusing and attractive. They were just like two boys.

Dan said that one time he and Chub were entering a store in Helena when the chief of police came along

"We broke fo' the riveh," Dan said, "an' jumped right in. We swum down the crossin' b'low Bonaparte Island—"

"Now you're lying to me!" Jerry smiled.

"Hue-e-e!"

The river rats laughed with delight.

"Yo' ain't so green's yo' look!"

"I hope them fellers comes acrost the way yo' 'lowed they would. We shore ain' no hard feelin's to'd yo', pussonally!" Delp said.

"You operate just like a government court," Jerry commented. "No hard feelings personally, but you have a sad duty to perform!"

"Yas, suh; jes' seo!" Delp nodded seriously.

"We're going to make them come across," Jerry assured him. "I've a heap more respect for you than for—for some old hypocrites I've known in this world of ours!"

One night Delp went out after mail and to scout around a little and see what was going on. Jerry and Chub played hearts till bedtime, and then they turned in. Bedtime was about eleven o'clock on the Fairy Land

Jerry worked away at his manacle for a while and found that at last he had it cut almost clear through on both sides.

"All I need now is a good chance to get away," he said. "But I hate to go before I learn what that Pittsburgh gang is doing with my property. I want to wake them up before I make a break."

CHAPTER XIII.

DELP GOSSIPS WITH A RIVER LADY.

DELP steered his way in the night through the bayous into Ozark Old River Lake and slipped out of Duckhunter Bayou, down the Arkansas into the Mississippi. He steered down to Arkansas City, where he obtained the mail, as soon as the post-office opened, and bought some supplies.

He did not linger there long, but returned up to Ozark Bend and stopped to talk with some of the river people in the lower end of the bend in the half-floating, half-up-the-bank town of Bolivar.

He called on Mrs. Rudsa, a hard, old river lady. She had a face like a man's, had her hair cut short and wore a short skirt, thick-soled shoes, and a blue blouse.

Her eyes were large, dull and gray. Her head was enormous for a woman of her size Her hands were like a large man's.

She looked as though she had whipped every hurricane, blizzard, and overflow during the past forty years, as indeed she had.

"Well, Gofer, what yo' all doin'?" she demanded of Delp.

"I ain't Gofer no mo'," he told her. "I'm Delp, Dan Delp. I jes' 'lowed I'd drap on my way up the riveh—"

"Yo' g'way! Yo' on'y drapped down this mornin'—I seen ye! Yo' be'n to Arkansas City, an' now yo's goin' back to yo' hidin'-outs!"

"Shucks! I 'lowed yo'd be'n asleep when I come by!" he grinned. "Yo' see, I was wonderin' if you all 'd seen a feller into a big stern-wheeler motor-boat, name of Fairy Land—"

"Ho, law! Now you's lookin' fo' that thousand dollars reward! Yo' ain't the on'y one. They's 'leven hundred rewardin' fellers up an' down, lookin' fo' that feller, Fander, yassuh! They's walkin' the bars to see 'f he ain't rolled up out 'n Old Mississip'.

"Why, Sheriff Doana's be'n out yeah, astin' us is we seen 'im! 'Bout everybody comes 'long is astin' has we seen the feller, er is we got them reward posters. I got 'em all pinned up around yeah, so's I won't forget. Look a' that!"

She pointed around the walls of her little old brick-red shanty-boat. There were nearly a dozen of the handbills offering the one thousand dollars reward for information about Jerry Fander. Delp went and looked at them, as though he didn't have one in his pocket already.

"Lemme have one, Mrs. Rudsa?" he begged, and she gave him one.

"He mout of drapped by yeah when I wasn't lookin'." The woman shook her head doubtfully.

"When yo' wasn't lookin'!" Delp grinned. "Sho! When was that?"

The woman smiled, complimented.

"Yassuh, he mout of, but I don't b'lieve he did. That feller showed up missin' twixt yeah an' Montgomery Chute. Mrs. Dipney seen 'im theh, an' then—*spang!* Away he went!"

"Jes' what I was thinkin'!" Delp shook his head. "What yo' make of hit?"

"I ain't made a nickel out'n hit, yet. I be'n kind of keepin' my eye open. I 'lowed he mout of got tore up into his bo't an' got drownded. They've had detectors up yonder, an' aroun', lookin' fo' him."

"Detectors is apt to get him, ain't they?" Delp sniffed scornfully.

"Well, they mout, if they could on'y find him hitched to a tree. I b'lieve that feller's cute.

"Them papers said they got a demand for a hundred thousand dollars, so's he wouldn't git hung, er sunthin'. He's one of them rich kids, an' I bet he's afteh money hisse'f. What do yo' bet?"

"I bet he is, too," Delp nodded.

"They wrote to Sheriff Doana, an' asted is he in jail in Ozark County, an' Doana tackled everybody, black, yeller an' white men, an' he wa'n't in that jail. Doana says all the other sheriffs an' marshals an' them 'ficials was asted thataway, too.

"But he ain't in no jail, so I jes' make up my mind that hit's that young feller hisse'f is behind this business. I seen some of them rich boys down Old Mississip' in my day, an' they spend money! Ho, law! How they spend money! He's broke, an' he's afteh money. I bet he don't git hit."

"'Cause why?"

"'Cause them fellers up to Pittsburgh has the money, an' they 'lows they's goin' to find him, an' let the law took hits course, that's what hit said into the *Memphis Battle-Ax*. Them fellers 'll let that young feller squirm an' wriggle aroun', an' they won't hand out no hundred thousand silver sinkers to no kid.

"Shucks! Why, that's 'nough money to support a million kids. 'F he'd 'a' asted for a hundred er a thousand, hit 'd be'n reasonable, but a hundred thousand! Shucks! They'll pay a thousand for him, now. But they won't pay no hundred thousand."

"Hit sounds reasonable, what yo' said," Delp agreed.

"The Kate landed in yeah this mornin'. The pilot, he's Choudre, yo' know. He says theh's a feller comin' down into a cruiser out'n Helena, goin' to write about us riveh people fo' the newspapers."

"That so? What kind of a lookin' feller?"

"Young an' slimmish—got a white hull, brown-cabined bo't. He's got one of them writin'-machines with him, too. He sets into his boat an' writes away like a good fellow!"

"Sho! What yo' reckon he'd find to write about down old Mississip'?" Delp asked.

"Good land, I don't know! If he'd knowed my second husband, he'd had a story to tell. Yo' recklect him? Old Gun-Fodder? Why, yes yo' do! He's the man them Whisky Hullinses killed up!"

"Sho! Course! Hit kind of slipped my mind!"

"Well, Old Gun-Fodder was some story-teller. If that writin' feller 'd knowed him, he'd 'a' had sunthin' to write about, but now—why, they ain't nothin' to write about now, on old Mississip'! They ain't be'n a killin' in Arkansas Old Mouth sinst when? Why,

sinst that old feller hit that lady theh with an' ax, 'cause she wouldn't marry him—"

"Tom Mardell?"

"That's the feller. *Then* he didn't kill her, an' when she come out'n Helena Hospital she married him, an' that's all they was to that. Yo' take hit when I fust come on the riveh—I wa'n't nothin' but a little slip of a gal, then—hit was sunthin' to write about down old Mississip', yes, indeed! But them days ain't no mo'!"

"Mebby he kinda 'lows he'd write about the levees, an' gov'ment works an' deep waterways, an' like that," Delp suggested.

"Oh, yes—scienterific writin's. I seen one of them fellers studyin' down along, up by Walnut Bend, wunst. He 'lowed to me as he was goin' to prove sunthin' er otheh about Mississippi water bein' good to enrich the soil, an' grow cotton, an' so on.

"Oh, he had hit all down fine, what he'd do, till one day his steam-launch—yo' 'member them kinds!—hit a snag, an' that feller had to swim five miles down the crossin', an' git up the cavin' bank down around Pushmataha Landin'. He learn sunthin' then, an' he neveh did git to plan hisns plans all out, no suh.

"What yo' doin' now, Gofer, Delp, er whateveh yo' be last?"

"Why, I—nothin'. Jes' trippin' around."

"Jes' trippin' aroun'! Ten minutes ago yo' was lookin' fo' that Pittsburgh feller, an' now yo' ain't doin' nothin'—jes' trippin' aroun'!"

"Hit were jes' amusin' to me, lookin' fo' him! Luck neveh broke my way, pickin' up a thousand dollars!" he whined.

"Nice quiet bo't yo' got theh!" Mrs. Rudsa remarked sarcastically. "'Fraid the motor 'd give yo' a haidache, so yo' had hit double mufflered an' trued up?"

"Hones', I ain't doin' nothin'!" he grimaced.

"Yo' bet yo' ain't, not with my eyes on ye, young feller! Yo' goin' to bust a commissary er rob a bank, er hold up somebody?" she queried, insistently.

"I—I ain't no need of bustin' into nothin'!" he hesitated.

"Oh, yo's jes' scoutin' aroun', waitin' tell they quit huntin' fo' yo', are yo'? Jes a gem'men of leisure, livin' on yo' money!"

"Yassum!" he admitted as if reluctantly.

"I knowed if yo' wa'n't goin' to do nothin', yo' jes' had been up to some devilin' aroun'."

"Where's that writin' feller from?" Delp asked

"Pittsburgh, somebody said—Pilot Choudre said hit."

"I see," Delp nodded, rising to go.

"What yo' hurry? I ain't goin' to eat yo'! Yo' betteh set whar yo' be an' have dinner, soon's I git up some sausage an' 'taters an' hot bread. My man—eveh met him?"

"Why, I—I—"

"This one's Troi Rudsa—"

"Shucks! 'Course I have! Him an' me was in the cattle business down on Red Riveh."

"Oh, yo' was, was yo'?"

"Why—I—"

"Theh! Yo's said 'nough. Of all the shiftless, no-'count, lazy men I eveh did git to marry, Rudsa's the laziest! An' him tellin' me he didn't know how to rustle cattle! Theh I be'n goin' out an' gittin' a nice line o' steers, an' heifers, an' him setting' back, not doin' a thing!"

"Where yo' sellin'?"

"Oh, down the riveh, an' shippin' some up, too."

"Ain't they neveh bothered yo' none, takin' cattle?"

"Wunst they was two fellers ketched me 'n' my boy. Hit was up Arkansas, about twenty mile. We salt-licked a nice herd in theh, an' then we killed down about ten an' pulled 'em into the riveh, an' started to float down

"Them two fellers, one what owned the X—brand, chased down on us. I held too low an' hit his hoss. That sickened 'em. We dressed out the beef an' yo' neveh seen nicer beef in all yo' borned days."

"I've hearn Arkansas beef's nice," Delp said. "I neveh done nothin' up Arkansas, but a little hoggin'. They was a contract job—willer-mat cuttin'—out aroun' the bars, an' they shore did eat pork that fall, yas indeed! We fed 'em so much they growed bristles.

"Hit were a good contract; nothin' but white men, an' good fellers. When me 'n' my pal needed he'p, two-three of 'em 'd come up an' he'p, jes fer the fun of hit! They was as nice a line of cane-rooters as eveh I seen, them hogs we killed up."

"How'd yo' git 'em?"

"Baitin'—sames yo'd bait wild turkeys. We laid out corn. I found a holler tree with a hole in the bottom an' one up about fifteen foot. We filled that tree full of corn, an' the hogs could git their snouts into the hole about two inches, an' root out the corn."

"Well, I declare! I neveh seen that done! I 'lowed if any lady knowed how to steal

hogs I did, but that's a new one to me! They'd come rootin' around, an' yo'd kill 'em. How'd yo' butcher?"

"A little .22 rifle. They'd neveh notice the shot. I'd pick off about ten-twelve in the ear, an' then drag 'em down the bank. Time we'd git them dressed, we'd git ten-twelve mo', an' that 'd made a load. They was mo' hogs theh when we come away than when we 'gun to kill 'em."

"Well, I'm goin' to try that! Hit 'd work nice on cattle, too!"

"I expect, but cattle's some wilder 'n hogs."

"Like's not!"

The arrival of Rudsa increased the conversation. Rudsa had stories to tell. He was a stocky, hard-built man, of about the same height and weight as his wife. He did as his wife told him, and Delp knew that if he didn't, there would sure be a peevish lady at Bolivar Landing.

After dinner Delp went on up to Arkansas Old Mouth. He had a piece of news for which he had been waiting. He was willing to go in, by daylight now, and tie there among people.

"Hit's workin', jes the way that feller said hit would!" Dan Delp agreed. "Good feller, that Jerry! I'd hate to have to kill that man!"

CHAPTER XIV.

ON THE CARPET.

THE executors of the Fander estate met in executive session on a Thursday afternoon. They were quite impassive of countenance, but they relaxed as soon as their secretaries and other impedimenta were out of the way, and the doors were locked on the inside.

These executive sessions were almost daily affairs. The trustees, Messrs, Faul, Kulle and Bough, had on their desk a complete report to date of the work that had been done toward discovering the whereabouts of Jerry Fander, the missing heir.

Among the rest were some hundreds of clippings, carefully annotated and indexed. Shadder's report, a lengthy account of his operations, was written on many pages of bond, with red stripes down the left-hand side of the sheets.

It was the newspaper clippings that most pleased the executors. The newspapers had risen to the fly of Jerry Fander's wildness. The young man's reputation was apparently hopelessly made.

Reporters far and wide had contributed to the anecdotes about his manner of life, and the things that he had done. His schoolboy fights, his college pranks, and episodes of his traveling days were recorded in detail and more than truthfully. The editors had not failed to comment about the spoiled young man, in whose blood was such a possibility of worldly usefulness.

"I very much doubt, I have very serious misgivings, as to whether Jerry will ever be able to qualify as trustee of the Fander fortune." Kulle gravely shook his head.

"I, too, have fears, with all this record against him!" Faul agreed.

"And I suppose we shall have to continue bearing up under the weight, the care, of the estate!" Bough echoed.

For a minute the three struggled to keep their countenances properly downcast, as befitted the passing of a young man of great promise but no fulfilment. But they had to give it up, first on one side, then on the other. Their lips twitched, and at last they leaned back in their chairs, grinning wide, until they showed their mouths full of long, white baroques.

"As it proves," Bough said, "the boy knew best! He insisted on his trip down the rivers, and he's fallen into difficulties—I fear very grave difficulties. I always knew his wilfulness would bring about his downfall.

"Just look at these terrible acts of his! Why, I had no idea how bad he had been!"

"The papers have saved us a great deal of expense and trouble, gathering all this material for us," Kulle suggested.

"Yes, but—um-m—that article about his life in the Pittsburgh paper. Seems to me"—Bough hesitated a moment—"seems to me it shows a great deal of undue familiarity with the—ah-h—affairs of the estate. Just notice:

> "It is a matter of considerable concern in financial circles as to whether or not the Fander estate is participating in the great Swamp, Delta and Bayou Railroad project.

"That is, decidedly, a type of article to which I object. It inquires into private matters and it should never have been printed—never! At least, not without submitting it to some one who knew—could give authentic information.

"Who wrote it, do you suppose?"

"The telephone—call up the financial editor!" Kulle suggested

"That's so; I'll do it. I know him—well!"

In a minute Bough was talking to the financial editor about the article which had been published on the previous Sunday.

"You read it? Yes? Oh, Young Walts wrote it, eh? I've seen him—know him quite well. I wonder if I couldn't have a little talk with him?

"All right—if he could come right over, I'd like to talk to him—confidentially, you know. He's a very bright young man—ah—I might say, almost too bright. You understand?"

When he turned to his fellow financiers, Bough was smiling grimly.

"Tallmutt understood," he said. "I thought it was just as well to give him a little hint of how matters stood. Of course, we don't want our affairs blatted all over the hills!

"Walts will come right over, and we'll have a little talk with him. I presume it will be quite impressive to him to find how very closely we keep tabs on such matters."

They read clippings while they awaited the arrival of Walts. Some were columns long, and some were only three-line flashes.

The arrival of Walts interrupted their enjoyment of the variety of opinions expressed about a young heir who would get himself into jail under an assumed name, charged with some dreadful crime—which was as yet unspecified.

The telephone announced Walts, and the secretary showed him in. The reporter was beckoned to a chair at some distance from the table. He drew a pencil out of his upper waistcoat pocket and a note-book from his coat, and was turning to a blank page when Bough snapped shortly:

"Put them up. This is not an interview with us; we desired an interview with you—first."

"With me?" Walts asked, astonished.

"Yes. Do you recognize this article?"

Bough had been a practising attorney before he went into high finance.

Walts took the long three-column-wide clipping and read down, skipping from paragraph to paragraph. He was trying to imagine what these men had in store for him. He looked up, suddenly, and caught each one of the three in the eye.

"Yes," he answered. "It was printed last Sunday."

"Do you know who wrote it?"

"Yes."

"Who?"

"I did"

"Where did you obtain the information which you incorporated in that article?"

"Some of it from you."

"From me? What do you mean?" Bough demanded

"I have interviewed you on several occasions, and you mentioned some of the things I wrote in the article."

"I never said a word to you about the Swamp, Delta and Bayou Railroad!"

"No?"

At that question Bough's face turned red with anger. Instantly, however, he recovered himself, for he realized that he had made an error in letting the reporter make him deny that specific part of the article.

"I wish to know—we wish to know—what you meant by this particular paragraph, which relates to the Swamp, Delta and Bayou Railroad. How did you happen to connect the Fander estate with that project? This is a very important matter!"

"It was a perfectly natural inquiry. Jerry Fander is missing; the executors of his father's estate are interested in the railroad; there has been some gossip—"

"Gossip! Gossip! Do you mean to say that you permitted yourself to admit gossip into a discussion of the Fander estate and of—of the great business affairs of—of my associates and myself?"

Walts made no reply. After a moment Bough continued:

"Where did you obtain the information upon which you based this article? What gossips did you listen to?"

"Newspaper men do not tell the sources of their information"

"Possibly, on the witness-stand, you might be persuaded to tell!" Bough suggested with cold severity.

"Possibly," Walts admitted.

"Well, wouldn't you tell?"

"That would depend."

"On whether you were going to jail for contempt of court?"

"Oh, no, not at all. It would depend on whether the source was to be treated as confidential or not."

"You would tell what you obtained from me?"

"Not without your permission, sir."

"Oh!" Bough exclaimed in spite of himself; and then ingratiatingly:

"Did any one put you up to that about the S., D. and B.?"

"No."

"But how—"

"I don't object to telling you. For some time I have been collecting information about various subjects and people. I keep a clipping-file. I keep note-books.

"When occasion arises, like this one, by re-

ferring to my files I am able to write a good deal more space than if I didn't have the information. That story there was all velvet to me—eighteen dollars. I just happened to wonder if there was any connection between the estate and your project, that was all."

"That was all! I wonder if you reporters will ever learn to mind your own business?"

Walts did not comment, though his face turned a little red.

"What do you newspaper men think about the disappearance of our dear young protégé, Jerry Fander?" Kulle asked with a keen look.

"They wonder what there is back of it," Walts answered, watching the expressions of the three.

What he saw made him make his own expression as perfectly blank as possible.

"What—what do you mean by that?" Bough demanded

"Mr. Kulle asked what newspaper men thought about it. Of course, I have my own idea. I said what they were thinking."

"Oh, yes—yes. And your idea?"

"He isn't in jail at all—just trying to play a game of some kind."

"You think that!" the three exclaimed in effect.

"Yes"

"But what grounds—on what grounds?"

"He isn't in any jail, for every jail in the South has been ransacked. Of course, perhaps he is a fugitive from justice—not in any jail yet, but liable to be. Of course, I am just guessing."

"You know, I wouldn't be surprised if—if the young man is right! He may be a fugitive!" Bough turned to his associates. "That would account perfectly for what has transpired."

"You haven't voiced that opinion in the newspapers?" Kulle asked.

"No, sir," Walts replied.

"Well, possibly it might help to find him to have that idea suggested. We—I suppose we might give him an interview for publication?"

"Certainly," Bough and Faul approved.

"Here are our reports to this morning. Mr. Shadder, who has charge of the search, gives us this report. You will see that one of his men says that Jerry was at—let me see—oh, yes! Montgomery Chute, where he talked with Mrs. Dipney, a storekeeper there.

"Then a short distance below, but above Rosedale, the detective met a young woman in a motor-boat, who gave him positive information that Jerry had gone up the Mississippi and to Council Bluffs or on the Missouri River somewhere. He paid her twenty-five dollars. Jerry was in full flight, you will observe.

"Also, it was a young woman who gave the information. In the interests of—ah—truth, I am obliged to mention her. Poor Jerry! There's a wild streak in his blood. Too bad!"

In unison the three executors bowed their heads in a grief that looked uncontrollable. Walts thought to himself that he would hate to see sorrow like that charging up Seventh Avenue, among a lot of children playing in the street.

"Thank you very much for telling me about this," Walts said, his pencil racing across the note-book sheets.

They let him read the reports, which were harmless from their view-point. They let him take a look at the accounts, too, showing that they were spending a great many thousand dollars in their efforts to find the heir of the Fander estate.

Among the papers that they handed him was a letter written on note-paper, and Walts copied it literally. It was the original note which had started the search for the young man.

This note had not yet been printed. Walts did not mention it. He had the feeling that it was a mistake on their part to include it among the sheaves of papers they handed to him.

When at last he had made his notes, he saw that he was dismissed by the three. As he turned the door-knob, Bough came over and rested a fatherly hand on his shoulder.

"Now, my boy," he said in a gentle, persuading tone, "we'll let it go this time, but when you desire to print any more accounts about large or important business affairs with which we are concerned, just bring your story around and let us see it. That will save mistakes, you know.

"The fact is, complete arrangements in the matter of the Swamp, Delta and Bayou Railroad were not made, and your question, had it been asked with more force in different surroundings, might have proved very, very embarrassing indeed."

"I meant no harn," Walts declared.

"Of course it was not meant. But finance and industry are very sensitive, influenced by even most apparently trifling events. No harm has been done this time.

"Now, if ever we can be of service to you, don't hesitate to call on us! We'll be glad to help you—help you in any way; personally, too, you know."

"Thank you, sir!" Walts exclaimed in real surprise, and left.

"What 'd you tell him that for, Bough?" Kulle asked.

"Because a reporter who keeps permanent notes and a clipping-file is the most dangerous or the most useful man in the newspaper business, depending on which way you treat him.

"That young man has a future before him! He has the look—he wasn't scared of us; he worried when he thought he might have made a mistake; he was grateful beyond words, for our giving him that story—that beat, I believe they call it. He'll write four columns and it will all be in our favor!"

CHAPTER XV.

ON THE TRAIL.

FRED WALTS wrote the story of the search for Jerry Fander by the Fander estate. It was so well written that it read like a chapter in a great novel.

No other really comprehensive account of the efforts made to find the young man had been told, and this article instantly revived interest in what had become a quarter-column, inside-page week-old sensation.

As Bough had foreseen, Walts's account was all in the favor of the executors, on the surface. It was their story, as they had given it to him.

The inclusion of the original note from the unknown, containing the request for one hundred thousand dollars, was not in the least shocking to any one.

The executors were a little startled by its appearance, for they had not intended to give it out, but as Walts wrote it, connecting it with the other facts, showing that apparently Jerry was a fugitive and not yet a prisoner, the executors of the estate found themselves subject to most favorable editorial comment.

The article, however, was only a chapter in a great story. It did not solve the mystery. It merely intensified public interest.

The fact that a young man in a large, beautifully built motor-boat could disappear from the ken of all the thousands who were seeking the one-thousand dollars reward gave a good many people a new idea of the lower Mississippi River.

The reporters covering the story from Vicksburg, Memphis, Helena, and other river towns were bombarded with telegrams demanding descriptions of conditions where such a thing could happen.

Articles appeared which told about the dark corners of the Mississippi bottoms. The descriptions read like pages from books on exploration in the jungles of the Amazon River.

People learned that in the bottom-land canebrakes men were easily so badly lost that they could not find their way out for days, if ever.

The famous bottom-land yarn of the surveyor who went into the St. Francis Dark Corner, ten miles above Helena, and was lost for three days with all the instruments, found its way into print. Then came accounts of Mississippi River steamboats which had disappeared. Some had been stolen by river pirates, others had just been swallowed up by the river, crews and all.

Walts one day found a letter in his letter-box. It was addressed:

REPORTER WHO WROTE
"The Search for Jerry Fander,"
(Nov. 19)
The Copewell, Pittsburgh, Pa.

He opened the envelope and found within a letter written on paper which, he instantly recalled, was the same as that on which the original Jerry Fander demand had been written. But this letter was written in a fine, beautiful chirography, almost, if not, quite feminine. The letter read:

DEAR SIR:

I have read with interest your account of the search for me, conducted by the Fander estate. But I am in such a dire extremity that I wish you would meet a friend of mine down here on the Mississippi River and hear the story of the truth of the matter.

I am held for ransom, but I wish you would not tell that till you get the rest of the story from me. And I shall be eternally grateful to you if you will look into this matter, which is one of life or death to me

I calculate that if you come down here immediately you will get to Helena, Arkansas, in ten days, say, December first, and my friend will meet you at Montgomery Chute, mouth of White River, or in Arkansas Old Mouth, which places you would visit on your way down in a motor-boat or shanty-boat, but motor-boat is best. I enclose money order for five hundred dollars so you will be to no expense yourself, and my friends

say you can get a little boat to trip down in cheap.

All you will have to do is just to come to Helena and down the river, stopping along, and telling that you are a reporter, and at Montgomery Chute and White River Mouth and Arkansas Old Mouth, and along there somewhere, you will meet my good friend, one of the best fellows you ever saw, who is my only friend in my extremity, as you understand.

My life is in the balance. I am chained to my own boat, and I can get free only by getting the hundred thousand dollars; hunting for me will just insure my getting killed, as I am in a Dark Corner, far from any chance of succor.

You write so friendly I am obliged to ask you to help me now. I see you wrote other stories of me, and they were fair, and did not make me out to be a habitual criminal, as some did. Very truly yours,

JERRY FANDER.

The letter had been mailed at Ducks, Mississippi, and the map showed that Ducks was far inland. The letter said "Down the Mississippi," however, and, of course, the letter had to be followed for any hope of success.

Walts, having read the letter, carried it to his city editor. The city editor, glancing at the signature, whistled, and then read it word for word.

Without comment he carried it to the editor, who called up the business manager. The three of them went over the letter, and then called in Walts.

"I wonder if it is genuine?" the business manager mused.

"How about it, Walts?" the editor demanded.

"What do you mean?" asked Walts

"Did Jerry write that letter?" put in the city editor.

"You take it, Walts," directed the editor, "and find specimens of his penmanship. Now will you go down the river that way he suggests?"

"Certainly—anywhere I'm sent."

"All right. But we cannot have the *Copewell* under any obligations. The business department will supply you with ample funds. Keep those papers to hand back to Jerry Fander—you understand?"

"Perfectly."

Walts did not go to the offices of the Fander estate executors for specimens of Jerry's writing. He went to schoolmates, and found several letters which were accessible for comparison.

The merest glance showed that the writing was Jerry's—the crossing of the "t," the peculiar "g," the slope, all the telltale peculiarities were palpable.

Walts returned to the office within the hour and said:

"The writing is Jerry Fander's without doubt."

"All right—beat it to the river!" the city editor said; and an hour later Walts, with a light typewriter and his camping-outfit, was on the train bound down the Mississippi Basin to Memphis. At Memphis he caught the steamer for Helena, and at Helena, where his knowledge of motor-boats stood him in good stead, he bought a twenty-two-foot motor-boat for two hundred and fifty dollars; it had a dog-house cabin over the bow, and a good little engine.

That night, as he put forth into the dark river, Walts was conscious of a tightening about his heart and a pressure at his throat. Frankly, seasoned though he was to danger, he was a little scared.

Did the scoundrel who held Fanders think that Walts knew too much, and were they using their prisoner to toll Walts into their hands for ransom, torture or maybe death?

Anything might be possible in the dark corners of the Mississip'.

(To Be Continued.)

WITH THE THROTTLE WIDE OPEN.

Railroads Are Doing a Bigger Business and Paying Higher Wages Than Ever Before.

Rock Island is planning to build a subway under its tracks at Moline, Ill.

St. Louis-San Francisco Railroad will soon build a new $300,000 station at Oklahoma City, Oklahoma.

United States Government has ordered also 6,000 30-ton standard gage and 2,997 narrow gage freight-cars.

Chicago and Alton Railroad has ordered 200 gondola car bodies from the Haskell and Barker Car Company.

Work on the electrification of the Salt Lake, Garfield and Western line is already under way. It will cost about $250,000.

The Gulf Coast Lines have granted bonuses amounting to about ten per cent to employees not connected with labor unions.

Earnings of the Swiss Federal railways for the past three years have been: In 1914, $9,264,000; in 1915, $10,808,000; in 1916, $11,580,000.

Lehigh and New England has awarded the contract for a line from Bethlehem to Allentown, Pennsylvania, to carry coal and general merchandise.

Employees in the mechanical department of the Great Northern have received substantial wage increases, the new schedule affecting about 7,000 men.

Construction of the Chesapeake and Ohio Northern, recently opened for traffic, included a steel bridge 3,450 feet long over the Ohio River at Sciotoville.

The South Station in Boston is the busiest in the country. In the six months ended June 30th, the traffic in and out aggregated 19,171,063 passengers.

The North Station in Boston is second busiest in the country and first among terminals used by only one road. Its traffic in the same period travel was 14,193,405 passengers.

International and Great Northern has granted wage increases to approximately 1,000 shop employees, adding $140,000 annually to the company's payrolls.

The J. G. White Engineering Company, New York, recently received a 300 h. p. gasoline locomotive from the McKeen Motor Car Company, Omaha, Nebraska.

United States Government has placed orders with the Baldwin Locomotive Works for 764 locomotives in addition to the 150 already ordered. All are for service in France.

Interstate Commerce Commission's returns for 153 roads, operating 186,000 miles, shows an increase in net revenue per mile from $433 in June, 1916, to $474 in June, 1917.

Chicago, Burlington and Quincy recently declared an extra ten per cent dividend, besides the regular quarterly dividend of two per cent, both payable on stock of record date September 25.

ONE OF THE MOST REALISTIC MOMENTS IN "THE RULE OF REASON" COMES IN THE BIG WRECK SCENE, WHERE, DUE TO THE CARELESSNESS OF BOB TRACY IN FORGETTING TO THROW A SWITCH, TWO TRAINS COLLIDE WITH A STUPENDOUS CRASH.

DOW'S NEWEST SAFETY FILM STORY.

"The Rule of Reason" a Powerful Screen Drama. Railroad Men All Over the Country to See It.

BY J. W. GREENBERG.

BOB TRACY, yard brakeman, was a good-natured, sturdy young fellow whom people liked — handsome, clean-cut, and of an amiable disposition. What is more, *Betty Hall* loved him, and had promised to become his wife.

But *Bob* had one great short-coming. He did not seem to feel there was any need of observing Rule G. The most important rule in the railroad man's creed he slighted.

And he was just fool enough to think that his habit of taking a swig out of the little brown bottle which he kept concealed in his closet would never be found out.

Not that young *Tracy* was in the habit of getting drunk, or, in fact, ever got drunk. He didn't dare risk that, for *Jack Foster*, his brother-in-law, with whom he lived, was yard superintendent, and his wife was a railroad woman through and through. And *Bob* had a pretty good idea of how much use real railroad people had for the demon rum.

Nevertheless, it wasn't long before the daily swig of booze began to show its effect. *Bob* became careless and slovenly. Yard rules which seemed unimportant were violated.

Yard Superintendent *Foster* had occasion to call him down several times. Bob grew worse. He got into habits known around the yard as decidedly unsafe.

Foster, hoping to inculcate into the young brakeman's mind what was meant by "safety first," called him into his office one day.

"*Bob*," he said, "I'm going to make you a member of the safety committee. I want you to attend all the meetings and hear the records read. I want you to learn how many accidents are caused by neglect and carelessness in little things."

Bob agreed. He attended the meetings; he heard the reports read. But he continued to drink.

The day soon came when *Tracy* was found out. While he was slyly "hitting the bottle" *Mrs. Foster* came into the room.

"*Bob!*" she cried; "don't do it."

He was caught in the act. It was a great shock to his sister. And as for the brakeman, he couldn't face her. The fear that she would tell her husband overwhelmed him.

"Please don't tell *Jack*," he pleaded. "It will be the end of everything."

She promised to remain silent on condition that he would not touch another drop of the stuff that proved the undoing of so many good railroad men.

Then he went out to work. It was a hot, lazy afternoon. The sun was shining brightly. A train was coming in on a yard track. *Tracy* walked listlessly over, set the switch, and then sauntered off.

Coming to a convenient place, he stretched himself out, took a long draft from the flask in his pocket, yawned, and was soon off in a heavy slumber.

He dreamed — a most horrible dream — A train going at high speed rushed into the yard.

"Good Heaven! I've forgotten the switch!" he shrieked.

But it was too late. The switch had remained set. There was a crash as the two trains came together and simultaneously a report like a cannon burst.

Loud cries of human suffering reached his ears. In an instant both trains were ablaze. Men were rushing madly about.

He, *Bob Tracy,* had caused it all. He alone was responsible for this awful calamity. Oh, why had he ever touched a drop of that stuff! Why had he broken this all-important rule which meant so much to the railroad he loved!

THE WIFE OF THE SUPERINTENDENT DISCOVERS THE CAUSE OF THE YOUNG BRAKEMAN'S NEGLECT OF SAFETY RULES AND TELLS HIM THAT BOOZE AND RAILROADING DON'T MIX.

It drove him almost wild to stand there surveying the mischief which had resulted from his carelessness. At first he could not bring himself to run, nor could he be of any help now. He was consumed with a mingled feeling of helplessness and horror.

Some one in the crowd that had gathered together quickly espied him.

"There he is!" the fellow cried. "Come on, boys, let's get him! He did it."

Young *Tracy,* almost mad with fear and remorse, knew he was running for his life. He rushed frantically across the yard, but before long fell exhausted. A few minutes later his pursuers were upon him.

Meantime *Mrs. Foster,* told of the wreck by her young son, rushed from the house, mounted a horse, and rode like mad to the yard. She came just in time to save *Tracy* from the fury of his fellow employees bent on vengeance.

"It isn't that I justify him, boys," she cried, "for I'm the wife of a railroad man, and have mighty little sympathy with the man who doesn't think of the safety of his fellows. But I'm sure that if you boys will let him off he never will touch a drop of liquor again. He's had his lesson. And when he lets booze alone he's a good boy."

Her plea prevailed.

Bob Tracy awoke from his nightmare with a start, a mumbled prayer of thanks on his lips. Then he realized he had been only dreaming.

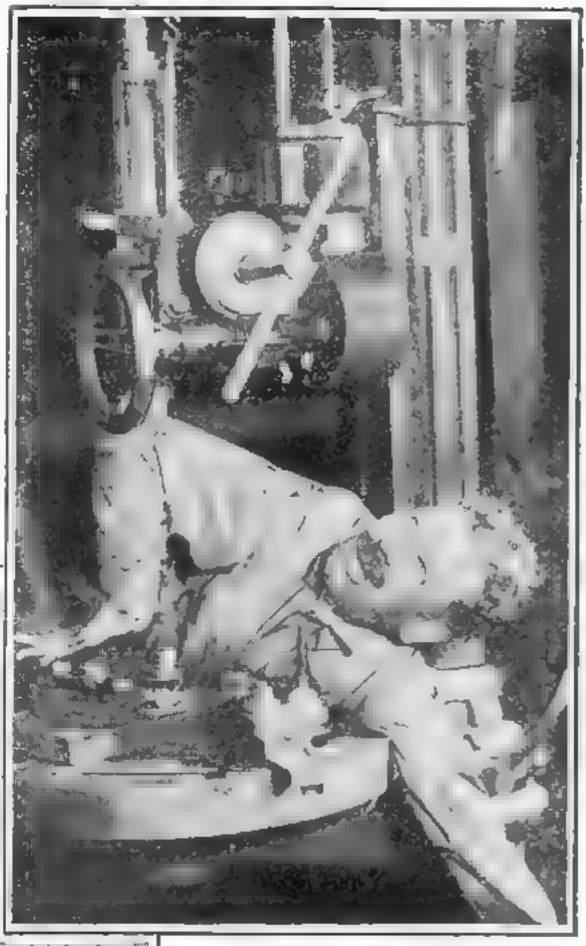
"Thank Heaven, it's only that!" he murmured fervently, and in an instant was wide awake.

With a bound he rushed off to the tracks and threw the switch. A few minutes later a fast train rushed by.

A smile of relief came over the face of the young brakeman. Then, as if the idea suddenly struck him, he reached into his hip-pocket, pulled out a flask, and dashed it against a rock near by.

"I've seen the last of you," he muttered with grim satisfaction.

And it was true. So true, in fact, that several months later *Betty Hall*, convinced that *Bob* was on the right road "for keeps," said "Yes" when he asked the question.



A LOOSE BIT OF CLOTHING CAUGHT IN THE WHEELS OF HIS MACHINE. THE BROKEN SAFETY RULE RESULTED IN A BROKEN ARM.

IT'S A BIT SHORTER GOING TO WORK BY CUTTING BETWEEN THE CARS, BUT IT IS THE DANGEROUS AND UNSAFE WAY—AND NEVER WORTH WHILE.

That is the story that Marcus A. Dow, general safety agent of the New York Central Railroad, is telling the road's thousands of employees in a new film narrative which he has called "The Rule of Reason."

Besides being shown in "theaters on wheels," it will be made the feature of safety rallies to be held in several cities during the coming months. It is expected, also, to furnish the film to other railroads and industrial companies.

By the Light of the Lantern

Ask us what you want to know

WE want to be as useful as possible to our readers, but, because of the great popularity of this department, we are obliged to impose certain restrictions. It is limited to the answering of questions of an informative, technical, or historical nature concerning the railroad business and allied occupations only. We cannot answer requests for positions or give information regarding employment. All letters should be signed with the full name of the writer, as an indication of his good faith. We will print only his initials. The editor begs that readers sending in questions will not be disappointed if the answers do not appear as early as expected. It frequently takes weeks to secure correct answers, owing to the complexity of the questions. All questions are answered free of charge. The editor earnestly requests his readers to bring immediately to his attention any errors they may find in this department. He reserves the right to refrain from answering any question.

WHAT IS THE MATTER?

G. M. G., Ceres, California.—The editor has examined closely the illustration of the locomotive of the Italian Government Railways appearing on page 633 of the August issue of the RAILROAD MAN'S MAGAZINE. We do not see any radical departure from the usual practise in the design or construction of the main driving-wheel. Therefore, in order to answer your question, "What is the matter with it?" you will have to tell us what you see is the matter with it, when we may be able to enlighten you further in the matter. Please be specific when asking questions.

PENNSYLVANIA EQUIPMENT.

E. M. M., Dayton, Ohio.—We could not devote the space necessary to give the complete details of the method of numbering the entire rolling equipment of the Pennsylvania system. If this data is of especial value to you, the "Official Railway Equipment Register," published monthly by the Railway Equipment and Publication Company, 75 Church Street, New York City, gives the numbers, capacities, *et cetera*, of all the cars on the United States, Canadian, and Mexican railroads. The price of a single copy is one dollar

YANKEE DOODLE LOOP.

R. V. M., Wheatland, Oregon, writes: On page 610, lower photograph, August number, you make this explanation: "Lariat or Georgetown Loop, the famous railroad coil that almost encircles Yankee Doodle Lake, on the line of the Denver and Salt Lake, just above Georgetown, Colorado. At the apex of the loop is the mining town of Silver Plume."

Isn't this all balled up? It seems to me that the Georgetown Loop is on the Colorado and Southern, near the mining town of Silver Plume, and the wonderful loop, which is faithfully reproduced, is on the Denver and Salt Lake Railroad, quite a distance away from Corona, "on the crest of the continent" just beyond

I only mention this, knowing you try to give the right dope, and I believe you are in error this time.

Your criticism is correct in every respect. The picture really shows the loop on the Denver and Salt Lake Railroad, encircling Yankee Doodle Lake, situated away up in the Rocky Mountains, 65 miles from Denver, and over 10,000 feet above sea-level.

"Balled up" is correct, for you will note from the fourth paragraph on page 209 that the author was apparently aware that the Georgetown Loop was on the Colorado and Southern.

We thank you for drawing the matter to our attention, so that we are able to set our readers right on the subject.

FLAGGING IN YARDS.

S. S., Springfield, Massachusetts.—"Safety First! Safety Always!" is the answer to Mr Shortflagger's argument. Rule 93 of the Standard Code provides: "Within yard limits the main track may be used, protecting against first-class or other specified trains. Inferior class and extra trains must move within yard limits, prepared to stop unless track is seen or known to be clear."

It will be observed that trains that must be protected against by the flagman within yard limits, and those that move with caution and prepared to stop, are left optional with the various roads operating under the Standard Code of the American Railway Association

However, under Rule 93, if a train occupies the main line in a yard on the time of a superior-class train, or if a first-class train or a section of a first-class schedule occupies the main line on the

time of another first-class train or section thereof, the train must certainly be protected by the flagman. Trains, other than first class, or those not specified by the railroad companies' rules for protection within the yard limits, would be responsible for collisions with a train or car occupying the main line. A train should never be left standing unprotected on the main line, whether first-class trains are due or not, as every precaution is necessary, especially when the view is obscure, due to the elements or other causes.

Crews operating within yard-limits are advised as to the trains that must be protected against when on the main line, and the only time that they or any other train may occupy the main track on the time of first-class trains without protection is when they obtain a train-order to do so.

K. C. S. TRAINMASTER.

E. P. C., Emporia, Kansas.—On the Kansas City Southern at Pittsburgh, Kansas, Mr. J. E. Murphy is trainmaster.

POSTAL CARS.

G. W. J., New York City.—There are at least half a dozen different designs of cars used in carrying the mails. For instance, there are at least three different combination cars that are used in postal service—namely, baggage and mail, mail and smoker, and a car designed with three separate compartments, one for baggage, another for mail, and a third fitted with seats for the transportation of passengers.

Then there are three distinct classifications of cars used for transportation of mail only—first, the postal storage-cars, suitable for carrying mail in bulk, without appliances for sorting or classifying; second, a postal car suitable for transporting newspapers or large mail packages, and third, a postal car having suitable apparatus for sorting and classifying mail in transit.

Our illustration shows the interior of the last-named type of car.

Note the collapsible center tables for sorting mail matter; the parcel racks high above the floor, and the hooks below, from which the pouches are hung. These are built to United States government specifications. The whole interior of the car is laid out so as to facilitate the work that has to be done.

The immense amount of work done in cars of this kind attest their usefulness and necessity in the present day when communication by mail is one of the recognized business activities of the country. These cars are equipped with mail-bag

INTERIOR OF A STEEL POSTAL CAR.

catchers so that mail may be picked up *en route* without the train being compelled to stop.

AVERAGE TIME.

W. F. H., Rock Island, Illinois.—We do not quite understand your question. If a train is scheduled 20 hours for a 1,000-mile run, its average speed per hour, including stops, would, of course, be 50 miles. Another train scheduled 24 hours for the same run would average 41⅔ per hour. Does this answer your question?

NAMES OF ROADS.

2. The roads you refer to are the Trinity and Brazos Valley Railway, which is part of the Colorado and Southern lines, and the Vandalia Railroad, part of the Pennsylvania system west of Pittsburgh. Don't know what E. P. A. T. stands for.

LOOP LINE.

A. H. N., Sarnia, Ontario, Canada.—Both Georgetown and Goulden are stations on what is known as the Loop Line, extending from Denver, Colorado, to the summit of Mount McClellan. It is a narrow gage, and is now part of the Colorado and Southern Railway.

SIGNAL ENGINEER.

R. W. G., Hibbing, Minnesota.—*The Signal Engineer* is a monthly publication, issued by the Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Illinois. The subscription price of the paper is one dollar per year.

PENNSYLVANIA ENGINES.

H. D. W., Brooklyn, New York.—The following are the principal dimensions of the E4 engines of the Pennsylvania Railroad, which are of the Atlantic or 4—4—2 type: Diameter of driving-wheels, 80 inches, cylinders, 20½ by 26 inches; minimum internal diameter of boiler, 65⅝ inches; size of fire-box, 72 by 111 inches; fire-grate area, 55 55 square feet; fire-box heating-surface, 166 square feet; total heating surface of boiler, 2,640 square feet; steam pressure, 205 pounds per square inch; weight on driving-wheels, about 125,000 pounds; total weight of engine, about 195,000 pounds; tractive effort, 23,799 pounds. Engines are equipped with Belpaire wide fire-box, Walschaerts valve-gear, and 12-inch piston-valves.

The E5 engines are of exactly the same dimensions as the E4 described above, with these exceptions—the cylinders are 22 by 26 inches; the weight on driving-wheels is 127,000 pounds; the total weight of these engines is 200,000 pounds, and the tractive effort, 27,409 pounds.

The K3 engines of the Pennsylvania are of the Pacific or 4—6—2 type. Diameter of the driving-wheels, 72 inches; cylinder, 24 by 26 inches; minimum internal diameter of boiler, 78 inches; size of fire-box, 72 by 110¾ inches; fire-grate area, 55.4 square feet; total heating surface of boiler, 5,170 square feet; steam pressure, 205 pounds per square inch; weight on driving wheels, 192,500 pounds; total weight of engine, 286,000 pounds; tractive effort, 36,244 pounds. Walschaerts valve-gear, piston-valves, and Belpaire wide fire-box.

Thanks. Glad to know that the lantern has been of service to you.

CHANGING VALVE LEAD.

S. G. F., Great Falls, Montana, writes: Suppose there is ¼-inch lead of the valve on the back motion, and 1/16-inch on the forward motion, how much would the eccentric have to be moved on the axle so as to give the valve 1/16-inch opening or lead on the back motion the same as the forward?

It would not only be necessary to move the eccentric, but would also require that the eccentric-rod be moved in order to equalize the amount of opening at each end The amount of opening at both ends, that is ¼ +1/16 inch being 5/16 of an inch, the mean amount of opening would be 5/32 of an inch

Supposing that the engine is in the forward center, with the piston at the extreme front end of the cylinder and the valve-opening, as stated, ¼ inch, in order to close the valve to 5/32 of an inch the valve-rod would have to be moved forward 3/32 of an inch, and in order to do this the eccentric-rod would have to be moved in the opposite direction the same amount; that is, if both arms of the rocker are alike

The engine should then be moved so that it should be ascertained that the openings at both ends are equal.

Assuming that 5/32 of an inch opening occurs at both ends, in order to reduce the amount to 1/16-inch it is necessary to move the eccentric a sufficient distance farther from the crank-pin to reduce the amount of opening. This would require a little more than 3/32 of an inch, because the eccentric does not move in a straight path, but in a circular path.

After the eccentric has been moved, the experiment of moving the engine to both ends of the piston-stroke should be repeated in order to ascertain if the openings are exactly alike, and of the desired amount. It will be understood that if the eccentric is held in place by a key, a new key with an offset would have to be substituted for the original key.

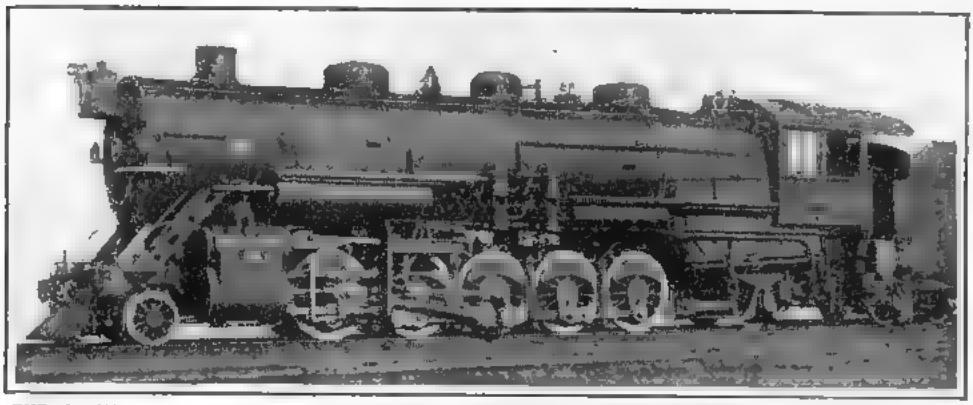
SPEED MERCHANTS.

I. G., Akron, Ohio.—Your friends must certainly be discussing the aeroplane trip of Miss Ruth Law or some other bird, not a railway train's time. Speeds in excess of 85 miles per hour have been attained with railway trains for a short time, but not for any such distance as 19

miles, except in one trip reported to have been made abroad.

THE BURLINGTON'S SANTA FES.

R. P., San Francisco, California.—The locomotive exhibited by the Chicago, Burlington and Quincy at the San Francisco Fair was a Santa Fe or 2—10—2 type engine. Early in 1912 the Baldwin Locomotive Works built five such engines for this road, and at that time they were the largest non-articulated locomotives in service.



THE SANTA FE OR 2—10—2 TYPE ENGINE EXHIBITED BY THE BURLINGTON ROUTE AT THE SAN FRANCISCO FAIR IT HAS A RATED TRACTIVE FORCE OF 71,500 POUNDS.

No. 6,110, as illustrated, is the engine that was exhibited at the fair, and is one of an additional lot delivered to the road in 1914, which had found the design very efficient in handling heavy coal traffic. The rated tractive force of these engines is 71,500 pounds.

The engine weighs about 370,000 pounds; with tender, 555,000 pounds. This type of engine has about 25 per cent greater hauling power than the Mikado or 2—8—2 wheel arrangement; and, carrying the same weight per pair of driving-wheels, the Santa Fe type will, under favorable conditions, effect a material reduction in the cost per ton mile of moving freight, and many of the larger roads have gone in for this type of power.

WAR LOCOMOTIVES.

R. M. D, Philadelphia, Pennsylvania.—Since the outbreak of the world war thousands of locomotives have been built in the United States for service abroad. The unusual design of locomotive to which you refer is one of a number turned out by the American Locomotive Company for the Belgian State Railways, and we publish on page 463 an illustration of it

In Belgium, overhead trolley lines are restricted, and while electricity is used in the cities, all interurban traffic is handled by small steam locomotives, which haul the passengers and freight to the cities where they connect with the electric lines. As the soil is of a very sandy nature, the entire running gear is enclosed so as to exclude dust.

As will be observed from cut on page 463, the enclosing sheet-metal extends from the bottom of the side-tanks. Access to the moving parts is had through the five swinging doors on each side

The engines can be operated from either end, an unusual thing being the hand-operated automobile horn on each end. The engine weighs about 59,000 pounds and exerts a tractive force of 9,500 pounds. The gage of the track is 39⅜ inches.

As a matter of general interest to our readers, we publish in this connection an illustration of one of a large number of locomotives built here for the British War Office for use around the battle-fields of France. These engines are of 2—6—2 wheel arrangement, weigh about 38,000 pounds, exert a tractive force of about 6,250 pounds, and are of 23.6-inch gage.

INDUSTRIAL AGENTS.

J. L. DeL., Rockford, Illinois.—There is no list published giving the complete list and official title of the various industrial and colonization agents of the railways. Nearly all of the larger roads employ special men in this capacity, but the title varies with the different lines, and such matters are very often handled by an assistant to the president or the general traffic manager

Under the circumstances it would be well to address the general traffic manager of the roads in which you are interested. The names of the general traffic managers and their location may be had from the "Pocket-List of Railroad Officials," issued quarterly by the Railroad Equipment and Publication Company, 75 Church Street, New York City. The price of a single copy is one dollar

FIRST TRANSCONTINENTAL TRAIN.

K. A. C., Cincinnati, Ohio.—On May 10, 1869, when the Central Pacific was made to join with the Union Pacific at Promontory, Utah, it became possible to go by rail from the Atlantic

to the Pacific. The first through car from the Pacific reached New York July 24, 1870.

U. S. RAILWAY MILEAGE.

E. S., Indianapolis, Indiana.—From the last official reports there are in operation in the United States 257,569 miles of railways. Of these 28,645 miles have double track; 2,714 miles have three tracks; 2,303 miles have four or more tracks

The mileage of yard tracks and sidings amounts to 99,910 miles; so that the total of all track-miles amounts to 391,141 miles. This does not include the mileage of switching and terminal companies, which adds about 6,000 more miles to the latter figure.

MILES BLOCK-SIGNALED.

2. At the close of 1916, 32,978 miles of road were equipped with automatic block signals, and 66,907 miles were equipped with block signals of the manual type. The total block-signaled is therefore 99,885 miles. Of the latter figure, 75,335 miles represent the single-track miles, and 24,550 two or more track miles.

LOCOMOTIVE ENGINEERS.

3. There are in service in the United States 59,071 locomotive engineers; 15,300 are engaged in yard service; 30,205 in road freight, and 13,566 in passenger service

LOCOMOTIVE PHOTOGRAPHS.

SO many of our readers write to us in regard to collections of locomotive photographs that perhaps some of them possessing pictures of New York Central engines can arrange exchanges with the writer of the following letter:

> For my private collection, I wish to secure photographs of New York Central engines, 40—46, 2—4—4 type, Roger's built for the New York and Northern, and also many of 500—600 and 700 class engines originally built for the West Shore; also engines 960 to 992 of the 4—4—0 type. Am particularly interested in old builders' photos lettered N. Y. C. and H R. R. R., such as Rome and Schenectady Works photographs. Communicate with David Goodyear, 348 West Fifty-Sixth Street, New York City.

DENVER AND RIO GRANDE.

A. B., Rochester, New York.—The Denver and Rio Grande has in operation 2,578 miles, 578 locomotives, and 18,648 cars.

LOCOMOTIVE CLASSIFICATION.

2. The Whyte system of locomotive classification and also the Baldwin Locomotive Works system was published in a chart in this department of the July, 1917, issue.

In regard to your other question, cannot say how you may obtain the bulletins referred to. They are prepared periodically by the Baldwin Locomotive Works, Philadelphia, Pennsylvania, and, as we understand, they are more for private than general distribution.

ILLINOIS CENTRAL.

E. M. M., Chicago, Illinois.—The Illinois Central has in operation 4,767 miles, 1,455 locomotives, and 65,025 cars. Space, or, rather, lack of space, will not permit of the publication in this department of the numbering scheme of the rolling equipment of this road.

C. AND O. RAILWAY TRAINMASTERS.

H. D. S., Savannah, Georgia.—The limitation of space prevents us from publishing a complete list of the trainmasters on the Chesapeake and Ohio Railroad. Here are some of them and their location—R. S. Anderson, Richmond, Virginia; J. A. Barker, Peru, Indiana; H. T. Brown, Huntington, West Virginia; L. F. Cabell, Ashland, Kentucky; J. W. Crawford, Russell, Kentucky; E. M. Curry, Hinton, West Virginia; S. E. Dearien, Thurmond, West Virginia; H. M. Eddins, Clifton Forge, Virginia; D. T. Evans, Silver Grove, Kentucky; J. C. Gray, Newport News, Virginia; D. C. Ogg, Clifton Forge, Virginia; M. C. Selden, Richmond, Virginia; S. L. Talley, Covington, Virginia; H. E. Webb, Logan, West Virginia; C. S. Wright, Richmond, Virginia.

LARGEST GONDOLA CARS.

G. E. A., Baltimore, Maryland—The largest gondola coal-car is used on the Virginian Railway. This car has a capacity of 240,000 pounds, although it is stenciled 218,000 pounds in order that the allowable loads will not be exceeded

These cars are used in carrying coal between the West Virginian fields and the Tidewater Terminal of the Virginian Railway at Seawalls Point, Virginia, where they are handled by the road's car-dumper.

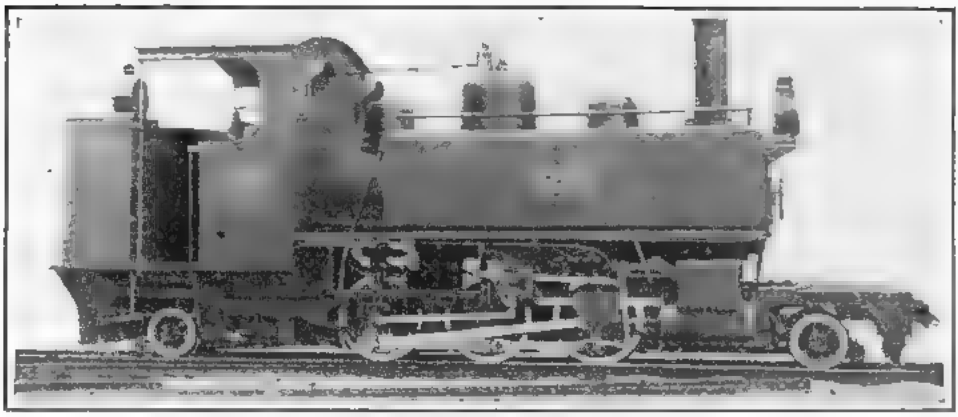
LONGEST STRAIGHT TRACK.

L. H., Nogales, Arizona.—Thanks for the compliments, and right smart pleased are we that the ladies take such a lively interest in the RAILROAD MAN'S MAGAZINE.

There is really no authentic record of what is the longest straight and level track in the world. We make no positive statements in regard to such matters in this department unless we know them to be absolutely true.

The reported stretch in the Argentine was 400 miles when we first heard of it, but this seems to have dwindled to 225 miles in later reports, and even now we are not certain that this is correct.

The nearest approach to anything official in this regard is the line from Nyngan to Bourke on the Western Line of the New South Wales Government Railways, the distance being 126 miles. In the Government Reports the line is supposed to



LOCOMOTIVES OF THIS TYPE ARE BEING USED BY THE BRITISH AROUND THE BATTLE-FIELDS IN FRANCE.

be straight, is 570 feet above sea level at Nyngan and at Bourke 350 feet, the highest point between the two towns being at Coolabah, 738 feet.

In this department we attempt to deal with facts, and facts alone, and refuse absolutely to describe anything as the biggest, longest, most powerful, *et cetera*, unless we know that such is absolutely the case.

GRADES AND CURVES.

F. D., Calgary, Canada, writes: Given the tractive force of an engine as 800 tons; the rate of grade, 1 per cent; the degree of curve, 4 per cent; length of grade, 2,500 feet, and length of curve, 600 feet, what tonnage should be deducted from above conditions, train running at a speed of 20 miles per hour?

When a train is hauled up a grade, the resistance is increased by lifting the train against gravity. One mile equals 5,280 feet, and if the grade be one foot per mile, the extra pull necessary to lift a ton of 2,000 pounds will be 2,000 ÷ 5,280 = .3788

Therefore, the total resistance due to grade in pounds per ton of 2,000 pounds, the rise in feet per mile must be multiplied by .3788. If the grade is expressed in feet per hundred a per cent, the resistance in pounds per ton will be 2,000 ÷ 100 = 20 pounds for each per cent of grade

The resistance owing to curves amounts to from 7 to 1.0 pound per ton per degree of curvature, the lower figure being used on large-capacity cars, as in the latter case there are more wheels and axles per ton of weight than in the former. A 4 per cent curve would therefore require an increased tractive effort equal to 3 or 4 pounds per ton.

Assuming that 6 pounds of tractive effort per ton will move a train of cars on a level, straight road at 20 miles per hour—and this amount has been generally acknowledged to be nearly correct, the amount added on account of a grade of 1 foot per mile and a curve of 4 per cent would require a tractive effort of 6 + .3788 — 10.3788

Therefore, as 10 3788 is to 6 50 is 800 tons to 462 5 tons.

If, on the other hand, the grade is expressed in feet per hundred, and 1 per cent of 5,280 feet being 52.80 per mile, 20 pounds will have to be added instead of .3788 or 6 + 20 + 4 = 30.

AN EXAMPLE OF THE DUSTLESS LOCOMOTIVES IN USE IN BELGIUM.

Therefore, as 30 is to 6 so is 800 tons to 160 tons. The length of the grade or curve does not materially affect these calculations.

FIREMEN AND BRAKEMEN.

G. C., Ilion, New York.—Primarily the general qualifications of applicants for the position of locomotive firemen and brakemen are the same. The applicant should be 21 years of age, he should have at least a common school education, and be able to assimilate instruction.

Generally there is no set height or weight, but he should be healthy and able-bodied so as to stand hard labor. He must also be of good character and habits. Applications should be made to the master mechanic or at division headquarters.

TEMPERATURE OF STEAM.

B. D., Orange, New Jersey.—The temperature of steam at 180 pounds pressure per square inch is about 380 degrees Fahrenheit. This may be said to be the temperature of the steam passing through the throttle. It is considerably less when it reaches the cylinders unless the engine is equipped with superheating appliances.

If the steam is expanded down so that when it leaves the cylinders the pressure amounts to only 5 pounds above the atmosphere pressure, the temperature of the steam would be about 228 degrees.

RAILROAD COLLEGE.

G. E., Lead City, South Dakota.—If you will write to the registrar, University of Illinois, Urbana, Illinois, he will furnish you the particulars in regard to the railroad courses offered by this university.

THE M. P. AND L. AND N.

T. O. P., Coshocton, Ohio.—There is scarcely a road in the country that does not have some portion of its lines single track. The Missouri Pacific Railway has in operation 3,477 miles of passenger lines, 2,981 miles of which are operated under block signals; 2,809 miles of these are of the non-automatic type and 172 miles of the automatic type.

The Louisville and Nashville Railroad operates 4,762 passenger miles, of which 539 miles are operated under automatic block signals, and 132 miles under block signals of the non-automatic type.

SNOW-PLOWS.

J. C., San Francisco, California.—Nearly all of the roads operating in the Northwest use snow-plows. The great rotaries very often operate against drifts higher than themselves. Cannot say where you might sell the plow in which you are interested, but if the design is patented, it might be well for you to submit the plans to some of the locomotive builders

MOST POWERFUL LOCOMOTIVE.

J. S., New Florence, Pennsylvania.—The most powerful locomotives in the world are the Triplex type engines of the Erie and the Virginian Railways, which exert a tractive force of something like 160,000 pounds; whereas the new powerful electric locomotive of the Pennsylvania, which you refer to, is rated at 87,200 pounds tractive effort. The new Pennsylvania electric locomotive is bigger than any other electric engine in one respect only; that is, that it has the power centered in one cab. The electric engines of the Norfolk and Western and the Chicago, Milwaukee and St. Paul exert greater tractive force, but consist of two units or halves operating as one machine

The principal characteristics of the locomotive in which you are interested in are:

Railroad classification	FF1
	ft in.
Over-all length	76 6¼
Total wheel-base	63 11
Driving wheel-base	38 8
Rigid wheel-base	13 4
Height from rail to locked position of pantograph	15 6
Height from rail to top of cab	14 8
Width over cab body	10 0
Over all width	10 1
Diameter of driving-wheels	0 72
Diameter of pony-wheels	0 36
Weight on drivers	198 tons
Number of driving axles	6
Weight of each pony-truck	21 tons
Total weight of locomotive	240 tons
Voltage of locomotive	11,000
Tractive effort at hourly rating of motors	87,200 pounds
	m. p. h.
Speed	20.6
	h.-p.
Capacity of locomotive—one hour rating	4,800

BOOK FOR VALVE-SETTERS.

M. W. H., Kansas City, Missouri.—A valuable work for valve-setters is "The Valve-Setter's Guide," by James Kennedy. This may be procured from the Railroad Book Supply Company, 838 Columbus Avenue, New York City; price fifty cents. For catalogue and further particulars of the firm's railroad and telegraph books and charts, write the company, enclosing two-cent stamp.

Telegraphic & Telephonic

IF there is anything you want to know about the telegraph, telephone, or radio telegraphy—if you have an operating problem that puzzles you—if you want to discuss a question of theory—write the RAILROAD MAN'S MAGAZINE. We have engaged a technical expert who is one of the leading authorities of the country on these subjects. Ask him. He knows!

PENNSYLVANIA SCHOOL.

W. L. K., Philadelphia, Pennsylvania.—The Pennsylvania Railroad School of Telegraphy has been moved from Bedford, Pennsylvania, to No. 1625 Filbert Street, Philadelphia. Thomas Saddington is manager of the school.

SOUTHERN PACIFIC RAILWAY.

F. G. L., Detroit, Michigan.—E. L. King is superintendent of telegraph of the Southern Pacific Company, with headquarters at San Francisco, California.

CANADIAN NORTHERN RAILWAY.

C. H. D., Portland, Maine.—H. McConkey is superintendent of telegraph of the Canadian Northern Railway, at Winnipeg, Manitoba.

GREAT NORTHERN RAILWAY.

W. J. L., Minneapolis, Minnesota.—What is known as the Montana Central Railroad is that part of the Great Northern system extending between Havre, Montana, and Butte, Montana. The names of some of the despatchers and operators employed on that line twenty years ago follow.

E. M Flood, R E. Williams, Ben Butler, O. D. Collins, D. J. Hagerty, John Maher, Arthur Engel, Dan McMahon, R D. Clover, H J. Keeley, P. J. Coyle, D. Hulse, George Rogers, and George Mainwaring.

TELEGRAPH SCHOOL IN CANADA.

F. J L., Smiths Falls, Ontario.—Replying to your inquiry and to similar inquiries from others desirous of learning telegraphy in Canada, we recommend Dier's Telegraph School, No. 148 Bank Street, Ottawa, Ontario. This institution is thoroughly equipped to teach railway and commercial telegraphy, and is in charge of long-experienced telegraph instructors. Graduates of this school have no difficulty in procuring desirable positions.

RADIO TOURNAMENT.

V. A. L., Portsmouth, New Hampshire.—At the telegraph tournament held in San Francisco, California, in August, 1915, the wireless event was won by A. E. Gerhard, who transmitted by means of key and buzzer twenty telegrams in twelve minutes, four seconds. The prize was fifty dollars cash. J. F. McKinnon won second place.

In the radio event only telegrams were transmitted, no straight matter being handled.

TELEGRAPH SCHOOL IN NEW YORK.

D. V. O., New York City.—Both the Western Union Telegraph Company and the Postal Telegraph Company maintain telegraph schools in New York City. Apply to chief operator, Western Union Telegraph Company, No. 24 Walker Street, and to J. J. Whalen, manager, Postal Telegraph-Cable Company, No. 253 Broadway, New York City, asking for an appointment.

RADIO ALPHABET.

G. L. K., St. Louis, Missouri.—We agree with you that the Morse alphabet as used on railroad and commercial lines throughout the United States and Canada could quite satisfactorily be employed in radio work. The Morse alphabet is more musical, is faster and easier to learn than the Continental code now used in radio operations.

During the nine or ten years prior to 1910, when the Deforest Wireless Telegraph Company controlled practically all American radio stations, both land and on shipboard, the Morse alphabet was exclusively employed.

RADIO IN CANADA.

V. P. S., Ottawa, Canada.—Answering your questions in the order submitted:

1. The Marconi Company maintains a school in Montreal. It is in charge of D. P. R. Coats

2. Some schools are able to graduate operators qualified to hold regular positions without the necessity of working at first as station helper. However, it is best to serve a short time as assistant at a station in order to learn the names of train-conductors and of officials and station routine

3. Yes, Dier's Telegraph School is thoroughly reliable.

4. Communicate with W. A. Kingsland, super-

intendent, Canadian Northern Railway, Montreal, Quebec.

NEW YORK CENTRAL SCHOOL.

J. M. W., Mountain View, New York.—Write to Mr. A. B. Taylor, superintendent of telegraph, New York Central and Hudson River Railroad, Grand Central Terminal, New York City, asking for information as to where you should report for examination.

There is a good demand for telegraphers, and if it is your desire to make a start on the Central, very likely you would be given the desired opportunity.

THE TELEGRAPH IN ALASKA.

J. W. G., New York City.—In Alaska, where the United States government is building a great railroad, the telegraph and telephone department officials have had to employ all the paraphernalia of "farthest north" in order to establish communication along the railroad. In the accompanying picture is shown a field telegraph station from which construction work was carried on last winter.

The Alaska Engineering Commission in charge of railroad construction work now has in service six hundred miles of wire, ten telegraph stations, two hundred telephone stations, a radio station, and a 250-subscriber telephone exchange at Anchorage, the headquarters. Mr E. R. McFarland is superintendent

TELEGRAPH POSITION.

B. L. J., Montgomery, Alabama.—You might communicate with W. C. Moore, chief despatcher, Mobile and Ohio Railroad Company, Jackson, Tennessee.

UPRIGHT SENDING MACHINE.

HAROLD L. C., Spokane, Washington.—The "Vailograph" vertical sending machine was invented about ten years ago by Frank T. Vail, of Minneapolis; but if this machine is still on the market we do not know where it may be purchased. The latest machine of the upright variety is known as the "Vertical Vibroplex," invented by H. G. Martin, and is for sale by the Vibroplex Company, 253 Broadway, New York.

TELEPHONE LOADING COILS.

G. M. D., St. Paul, Minnesota.—It is possible that Willoughby Smith, in England, in the year 1879, was the first to suggest the use of distributed inductive shunts along a circuit with a view to improving the operation of cabled conductors.

A FIELD TELEGRAPH STATION IN SNOW-BOUND ALASKA FROM WHICH CONSTRUCTION WORK ON THE GOVERNMENT'S RAILROAD WAS CARRIED ON THERE ARE TEN SUCH STATIONS NOW IN THE SERVICE.

At the International Electrical Congress, held in Chicago in the year 1893, Silvanus P Thompson presented an important paper on the subject of ocean telephony which contained valuable suggestions for improving telephonic transmission by means of distributed inductance.

Professor Pupin's first complete paper on the subject was presented before the American Institute of Electrical Engineers, New York City, May 19, 1900. The title of Professor Pupin's paper was "Wave Transmission over Non-Uniform Cables and Long-Distance Air Lines."

TELEPHONE INVENTION.

GEORGE W. G., Columbus, Ohio.—Answering your questions in the order submitted:

1. James A. Garfield was the first President of the United States who used the telephone.

2. In 1876, the year in which the telephone was invented, the number of telegrams handled in the New York office of the Western Union Telegraph Company was 35,000 per day. At the present time the same office handles about 200,000 telegrams per day.

3 The patent application covering the invention of the Edison carbon-contact telephone transmitter was filed July 20, 1877.

NUMBER SYMBOLS.

C. V. M., Butte, Montana.—In the January issue of this magazine we gave a list of all number symbols used every day in telegraph service. The symbols you inquire about have never been used to any great extent. Symbol "134" means: Who are you at the key? Operators prefer the shorter letter-symbol, "wo," signifying, Who?

Symbol "77" means: I have a message for you. Operators prefer simply to say, "msg"

Symbol "45" signifies: Answer quick by telegraph. In practise the abbreviation "ans" serves the same purpose.

LEARNER'S MORSE SET.

H. M S., Pittsburgh, Pennsylvania.—A very good learner's outfit, including key and sounder on one base, may be purchased for two dollars. Postage shipping weight is three pounds.

TELEGRAPH VERSUS TELEPHONE.

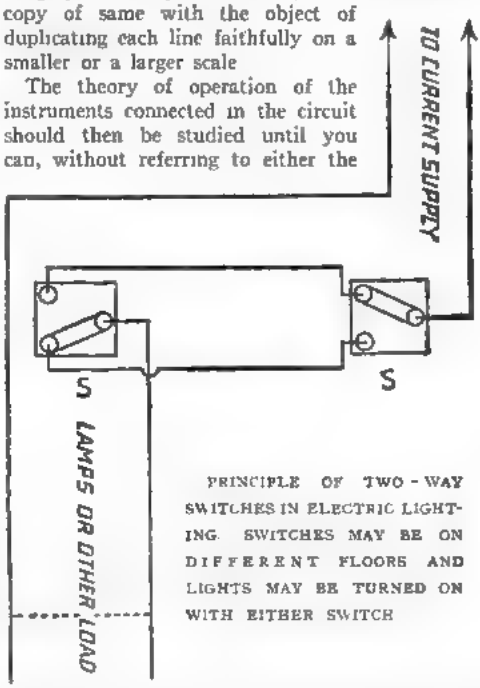
EDWARD M., Newark, Ohio.—Along railroad lines where both telegraph and telephone lines are used it is quite usual for despatchers' offices and relay offices to call way-office operators on the telephone and ask them to answer on the telegraph wire. There may be a psychological reason why operators answer the phone more promptly than the telegraph; but it would seem wise for all telegraph men who hope to see the sounders survive to give telegraph calls at least as fair a shake as telephone calls are given

If this were the universal practise, the telegraph would once more come into its own on lines where both services are employed.

ENGINEERING.

G. D. F, Portland, Oregon.—The study of electrical wiring blueprints and the practise of drafting are the first steps in the study of electrical engineering. A good plan would be to procure a standard blueprint of some particular telegraph or telephone circuit, and then make a copy of same with the object of duplicating each line faithfully on a smaller or a larger scale

The theory of operation of the instruments connected in the circuit should then be studied until you can, without referring to either the original print or the copy, make a new drawing of all the connections and instruments in their proper relations. A set of drawing instruments would cost about five dollars, and you can procure single blueprints of any circuit at twenty-five cents each.



PRINCIPLE OF TWO-WAY SWITCHES IN ELECTRIC LIGHTING. SWITCHES MAY BE ON DIFFERENT FLOORS AND LIGHTS MAY BE TURNED ON WITH EITHER SWITCH

C., M. AND ST. P. RAILWAY.

H. M. M., Detroit, Michigan.—E. A. Patterson is superintendent of telegraph of the Chicago, Milwaukee and St. Paul Railway, with headquarters at Milwaukee, Wisconsin.

CHARLES H. GAUNT.

EMERY W., Marquette, Michigan.—Mr. C. H. Gaunt, who at one time was superintendent of telegraph of the Santa Fe lines, is now general superintendent of the Western Union Telegraph Company, Chicago, Illinois.

DESPATCHERS' OFFICES.

W. W. F., Philadelphia, Pennsylvania.—Your statement to the effect that train-despatchers' offices are, as a rule, not as well

equipped or as conveniently arranged as the main offices of the commercial telegraph companies calls attention to a condition that has often been noted.

In his travels east, west, north, and south over American and Canadian railroads the editor has observed that in many instances despatchers are cooped up in dingy, low-ceilinged, poorly lighted, and improperly ventilated offices.

In the medium-sized and in large commercial telegraph-offices overhauled within the past ten years, in most cases the best possible facilities are provided the employees. These facilities include convenient toilet and wash rooms, rest rooms, individual clothes lockers, operating-rooms properly heated and ventilated, window awnings, sanitary flooring, conveniently located clocks with extra large numerals, light walls and ceilings, and a regular supply of good drinking water.

There is no trade or calling in which the mental strain is greater than in train despatching. A clear brain and an unfailing wit can be looked for only when bodily health is properly maintained.

In the interests of safety and efficiency, railroad companies always make satisfactory investments when money is applied in improving the working conditions in despatchers' offices.

WIGWAG SENDING.

T. Y. L., Detroit, Michigan.—The trouble you are having with your vibroplex is not unusual. It is wise to keep in mind that a vibroplex or any other type of machine sender is not automatic; it is necessary that the operator always exercise his best judgment in using a transmitter of any type.

The aim always should be to imitate as closely as possible good hand sending. The weights on the lever of the transmitter should be so set that not more than eighteen letters "P" can be sent in ten seconds' time.

When transmitters are used in sending over duplex circuits, and on lines containing automatic repeaters, the distant station sometimes complains that the sending is "light." After all other remedies have been applied, the sending may be made heavier by connecting to the binding-post terminals of the transmitter a resistance-coil of about 500 ohms.

A 40-watt incandescent lamp mounted in a receptacle so that two wires may be led from the receptacle terminals to the binding-posts of the transmitter will serve the purpose.

The principle of this arrangement is that the time-constant of duplex pole-changer is reduced owing to the fact that the local P. C. circuit is never open. When the key or wigwag is open some current still passes through the coils of the pole-changer; keeping the magnet-cores partially magnetized—but not sufficiently to hold the armature in the closed position—so that when the key is closed the time required for the current to build up strong enough to attract the armature is considerably reduced.

TELEGRAPH BOOKS.

K. L. G., Norfolk, Virginia.—Yes, the Railroad Book Supply Company handles telegraph as well as railroad literature. The concern's new address is 838 Columbus Avenue, New York City. Send two-cent stamp for its catalogue.

RAILROADS—LAID WHILE YOU WAIT.

BRITISH PUTTING DOWN A READY-MADE TRACK THROUGH A FOREST IN FRANCE.

Official British War Photograph from Bain News Service.

NEW DEVICES FOR RAILROAD SAFETY.

THE engineer of a Western railroad, on whose line there were many wagon-road crossings at which accidents have occurred, evolved the idea of compelling motorists to slow up before the crossing was reached. At first he placed a mound of dirt about twenty feet from the tracks, which caused the drivers to slow up.

This, however, was decided by the courts to be an obstruction of the highway. Next he equipped several crossings with the sign and the sharp road-curves shown in the illustration. This has proved satisfactory.

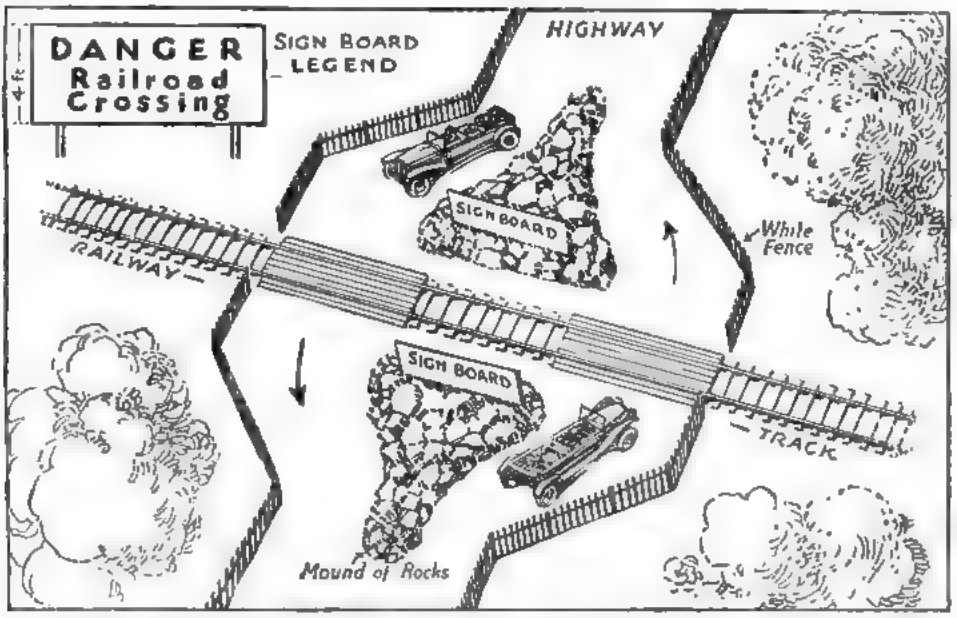
The fence is painted white, so that it can easily be seen. A V-shaped mound of rocks in the center on each side of the track compels the driver of the motor-car to turn sharply, thus reducing the speed of his car

The sign itself, four feet high and six wide, is mounted on two posts, raising it three feet above the surface and several inches above the rock-pile. The letters on the sign-board are so large that they can readily be seen at a distance of five hundred feet

This make of crossing has been declared legal by the courts, and is being adopted by several Western railroads. It is not patented.

Ordinarily we do not print descriptions of devices not patented, but we have made an exception in this case because the inventor has gone beyond the experiment stage, and, in addition, gives the product of his ingenuity to the world.

A trainman, working on a railroad traversing Colorado, has invented an alarm which gives notice when all windows are not closed before the train reaches a tunnel. It consists of an electrically operated semaphore whose action is automatic.



BY CONSTRUCTING FENCED-IN ROAD CURVES AND ERECTING MOUNDS OF ROCKS ON WHICH HE HAS PLACED CONSPICUOUS SIGNS, THE ENGINEER WHO DEVISED THIS SCHEME FOR PROTECTING DANGEROUS CROSSINGS HAS COMPELLED MOTORISTS TO SLOW UP AND THUS ELIMINATE ACCIDENTS

Normally, when no tunnel is near, the signal lies against the side of a car, up near the ventilators. After the windows have been closed the turn of a button energizes a magnet, which operates a call bell.

Should the trainmen have overlooked a window in the train, the bell rings when the current is turned on, the windows being connected in series in the circuit, the battery operating a "drop." When the windows are all closed, the drop remains up against a magnet when the current is turned on

Otherwise the drop completes the bell circuit and sounds the alarm which sets the device in motion.

If the drop falls, the little semaphore turns at right angles to the aisle of the car, and the open window is easily located.

"HELP ON THE HILL."

BY BUCKLEY OLCOTT.

The Dull Job of Pushing a Stalled Drag Up-Grade Is Not without Its Lighter Features and Incidents.

T isn't in the order of things that railroading should be a wholly serious-minded proposition (remarked a scoop-juggling gentleman who is well known to smoky-end fame out on the old Fitchburg pike). There are too many different brands of humorists bucking the grade to ever let this gentle pastime get into the slough of despond to any perceptible extent.

And the beauty of it is, these railroad Cobbs and Cohans and Foys don't know they are pulling something really funny. They just act natural and talk natural, and Nature—bless her—does the rest.

It was back in the beginning of 1913. I had been firing just long enough to know more about the art of shoveling smoke than half the railroad talent east of the Rocky Mountains.

At the time I had been in off a Mickyville rawhider a little better than eight hours when the crook who did the calling at that particular burg where I was marked up dug me out of the timothy to sign for a job going east.

Along about that time the road was sending home the last of some Central whales that nobody on our pike had been having much luck with.

When I blew into the oil-room, Ed, the handsome Hungarian who presides thereof, greets me with a wide, open-face grin, which same was to my mind all out of proportion and more or less uncalled for.

"Well," I says, "what's funny?"

"Oh, nothing," he says, still smirking like a Suwanee Indian. "You're taking No. 2811 west, that's all. She's the last one of the Zepps. And you're going light."

Hearing which, I also tore off what was meant for a piece of facial sunshine. Only if I'd known then what there was back of friend Ed's happiness, I'd have winged him with the first thing I could lay a hand to, whether it was a lantern or a lead hammer. Half the pleasure that guy gets out of life is wishing scrap-heaps off on defenseless tallow-pots.

The hogger on the job was a gentleman known as Robert Romans. Please note that I refer to Robert as a gentleman.

The flag we had wasn't apparently going to enter into the plot to any alarming extent, being altogether too near a state of eternal rest. He was so near gone that if you'd told him he was alive he'd have called you a liar.

Well, I looked over the hog, and kind of put a valuation on her, and it wasn't very high, either. She was pretty well shot to pieces. In all probability she'd been pretty good in her days, but that was a long ways behind her.

I hooked and jammed and blew and hung a red light on her tank and took a little water, and we were ready to go. Robert got aboard and looked her over and talked to Abraham about her and looked out of the window and swore at the shack in particular and the switchmen in general, and we got out of town.

For the first thirty miles we plugged along west with all the little Joys riding with us. Nothing happened, except once in the early stages of our progress when we overtook a cross-country liner stalled out at Westminister, and were requested to

lend our assistance at getting 'em over the present grievous hump.

"Mr. Man," says Robert, addressing his remarks to the captain of the drag, who had presented the request, "we are taking this animal, you observe us burdened with, west, light. And in the first place she isn't in what you might call a perfect state of health, so we've got to be careful of her.

"Furthermore, far be it from me to desecrate her dejected old spirit by asking her to labor at the back end of your deluded old red wagon. *Light* we started on this little picnic, and *light* we remain—unless the wooden-headed walruses out yonder dictate differently!"

We run around 'em at the next middle west and proceeded on our merry way.

It was at a hamlet called Athol, though, that we met up with the selection of grief that inspires this tale. There was a red order-block out for us here as big as a full moon, and seven miles of freight-trains looming in the night down on the *east*-bound.

"I do hereby nurse a hunch, son," says Mr. Romans, hossing up the handle of the New York air equipment, as we slid along opposite the station, "that we are going to cross over here and help some of these contaminated jobs up Royalston."

And, gentlemen, those were the orders. Also, I knew why Ed grinned. He had been mighty careful not to mention the catch in this joke, because he had known all the time what we had been sent out light for.

Here it was! Help three trips on the hill.

"Robert," I says, "right now I'm a sick man. I've got a bad pain in my bowels. I think I've got appendicitis. I'm going to deadhead home, and you and the shack can stay and help on this blasted old hill till there is a thin coating of ice on the river Styx! Yes, sir!"

"Don't do it," advises the hogger. "Stick!"

"No," I says; "nothing doing! I'm not taking any chances. Haven't I had wo enough with that old junk-pile as it was, without firing her up the blooming hill here three times behind a train? I wouldn't shovel smoke on this old teakettle when she was working steam with a load for ten dollars a mile. And that's fi-*nal!*"

"Wait a minute, you Oswego savage!" says the Honorable Bob. "Listen! Did you ever hear tell of mental suggestion, son?"

"Not on the firing end of a freight-hog, I haven't," I says. "Nothing but vocal!"

"Nevertheless," says Mr. Romans, as we drift down toward the cross-over, "there is such a thing. For instance, you have, maybe, observed that even at such times as she is working with her way down in the corner, these Central battle-ships don't exhaust over and above lusty—they don't bark loud and crude like our own whales, till you can hear 'em over in the next county."

"And what if they don't?" I asks him. "They burn coal just the same, and they've got a reach like the Utah Desert between their coal-gates and these old double doors."

"Well, anyhow," says Robert, "for the benefit of your blank, untutored intellect I'll enlighten you to a certain limited extent. To begin with, you stick with your godfather and you'll wear diamonds. Next, don't ever crawl. And for the life of Mike, if you've got it in your system that you've *got* to quit, don't do it on a fine, nice-paying job like this."

"That's all right for you," I says, "but take note that it's *me* who's doing the shoveling and the hooking and the grunting."

"That's all right," says Mr. Romans, "but if I catch you doing any hooking or grunting to-night, I'll clam you back of the ear with the rugged end of a Stilson."

"Well," says I, "don't you lose any sleep on account of worrying about me straining myself as long as I'm on *this* old tramp. And as for this mental-suggestion dope, I don't savvy your line a little bit, but let me assert right now that I'm strong for it."

In late years all helping on Royalston is done from the front end, but at that time it wasn't considered a breach of etiquette to get on behind. So we took a little water, kicked down a little coal, and Robert *toot-tooted* that we was ready for business.

The first job was a double-header, with a couple of big twenty-six hundreds popping up front. They plugged by and we went out and caught them on the fly.

"Now, feller," says Bob, addressing himself to our shack, who was about to climb onto my cushion, "you run over and ride in the buggy."

"What for?" demands our ornamental friend.

"Be-cause," drawls Robert, reaching down back of his seat-box for that "fourteen," "I feel it in my bones that I'm going to throw a fit. And who knows but that I might hop over and clout you on the bean with this young pipe-wrench?"

And he commences waving the aforesaid Stilson threateningly.

"Aw, go to—"

And the shack told Robert where.

Just the same I noticed that Mr. Flagman started climbing up over the coal-gates right off. But that was about as far as he did get. When he got up on top he picked up a hunk of coal and sat down to see what was coming off next. Meanwhile, I bailed in a fire and hit the seat-box.

Robert hauled the Johnson bar up about two notches front of center, eased the throttle out just about enough to pick up the slack in the head coupling on the buggy; then stuck his feet on the boiler-butt, slipped me a suggestion concerning opening one of the doors once in a while to give 'em a little fire effect, and went to sleep.

When we got up to the middle I woke the hogger up, and we crossed over and came back down the hill.

"Well," says Mr. Romans, "how'd she go?"

"Fine!" I says. "Those two pigs up ahead went to it and worked their blooming heads off."

"Sure they did," says Robert, with a grin. "All they needed to know was that this big gomodon was at the tail-end, which took a large load off their minds. If the hitch dragged slow they only went to it and rapped 'em all the harder, trying to get somewhere while they had a helper. Mental suggestion, son!"

The next job was an extra couple of hundred ton light. They got along fairly well, while we trailed 'em, taking the strain off the head pin of the crummy.

But the third hitch was a son of a gun. It was one of the fast freights return. Their old hog wasn't doing much of a job, and they had pretty near tonnage, anyhow. They stalled four times before they made Pequoig Siding and twice between there and the steel bridge.

About half a mile west of Royalston their con came over and conferred with our flag, who was riding out on the tank every trip. Then he come down and asked Bob what was the matter with our dang-blasted old cayuse; couldn't he squirt a little more pep into her works and help as far as Baldingville?

Robert said he couldn't, for the simple reason that he was expecting the old whangadoodle to blow herself into the middle of next week 'most any time, and he didn't want to hasten her demise.

The car captain left us practically immediately; and we dropped off and beat it for the west end.

And that was all right. And the goose hung high.

A couple of weeks later Mr. Romans and I caught a helper job on Ashburnham. The goat was one of the "saturated" whales.

She'd lost her arch, and in consequence thereof burned coal in car-load lots. We'd made two stiff trips and were for calling it a day when the switchman passed us the glad tidings that we were going to help one of the fast freights.

They dragged into town about twenty minutes later, and we backed on ahead and whistled off.

Gentlemen, if I told you how many times we stalled on Ashburnham that night, you wouldn't believe it. I fired and Robert fired and the lad who was flagging for us fired. And the old mill slipped and bellowed and pawed and grunted till I thought she'd blow her blooming old front end out.

"By the humping, buckling bands of mercy!" says Mr. Romans, as I relieved him on the battle-scarred deck, mopping his face and glaring back at the second pig's headlight. "I've helped a lot of fast freights up this blasted hill, but this is the dad-blamedest old sticker I ever did see.

That old, black walrus back there hasn't pulled ten pounds since we passed the west yard."

Fifteen minutes thereafter we cut off and ducked into the clear, while the fast-freight job drifted down past us.

"Hey! What was the matter with you rummies?" Mr. Romans bawls at 'em when their hog come by. "What in the sacred name of Maggie G. Dooley were you gosh-hang bean-eaters doing back there all the way up?"

"*Using mental suggestion!*" yelled the tallow-pot. "Don't that let us out?"

Their head-end man was the guy Robert kept up on the coal-pile three trips up Royalston. This was one of the jobs we helped with the old Central battle-ship.

Which reminds me (said a lanky smoke who had been lounging over in a corner of the engineers' room). It wasn't over a thousand miles from here that I was firing at the time I refer to. Everything and everybody was being crowded the limit. Stoking a freight-hog then was no gentle pastime for a minister's son. You got your old shirt off your back and earned your daily bread, and there was no doubt in your mind when you got in off a trip but that you *had* earned it.

You mentioned fast freights. There were two on this pike where I was punishing smoke that were supposed to follow each other—or that is, No. 67 first and No. 69 trailing—ten minutes apart.

And the funny thing about it was, they always loaded No. 67 till she could just wiggle out of town, while No. 69 was generally lazing along behind 'em on a yellow block, about three hundred ton light.

But anyhow, we are up in the hill waiting for these fast freights. We have been out twelve hours, and are dog-tired. Therefore we aren't saying a word because they are about an hour late and we don't have any time on them. I wasn't fussy if they never came

Just the same No. 67 butts into my fairy-land about the time I'm beginning to enjoy myself. The drag is having all kinds of a rotten trip, and this hill doesn't lighten their grief a little bit.

Their tail-end inches past, and we settle back to wait for No. 69. About here one of these I-am-king trainmasters climbed up through our gangway. He had dropped off No. 67's buggy.

"Head pin!" says he abrupt and frosty. "And help this job to the second siding."

"We haven't got coal or water or any kind of a fire, and I don't think we had better," says pig-eye John McGunn, looking his honor over careful.

"I don't give a hip-roofed hurrah in Halifax what *you* think!" yells this white-collar lad, peaking up his face till it looked like a dried carrot, and glaring Mr. McGunn in the eye. "I'm telling you *what* to do!"

"Well, don't think you can climb onto my engine and get snorty, you hungry-looking sausage," says friend John, who is a untrampled Yankee in belief, "because you can't get away with it, in the first place; and in the second place, you know as well as I do that it isn't safe to put one of these big engines helping behind them old tinder crummies."

"Do I understand then that you *refuse* to take instructions from me?" squawks this five-foot-six Mohammed, dancing around like a troubadour toe-dancer.

"No-o," says John McGunn soft and low, "not if you're absolutely sure you *want* me to get behind No. 67's old red hearse and help. I'm the most accommodating cuss you ever saw if you go about it right."

"Well, get out there!" snaps the official. "And don't be afraid to do a little work"

"I won't!" says John, easing the pig back on the pin. "You needn't let that little thing worry you."

We caught the tail-end up around the curve, and Mr. Trainmaster climbed out my front window and went back to the buggy.

Meanwhile, John McGunn put his foot back of the latch on the reverse and slammed her down into the corner; then yanked the throttle lever out till it was pretty near parallel with the direction we were going.

"Wind her up there," John says to me, "and we'll give 'em a ride!"

And we did. That fast-freight hitch began to pick up right off. We hadn't gone a mile when the crew got out on the front platform of the hack—and his worship was riding down on the last step waving us an "ease-off" signal. Mr. McGunn, however, merely gave him a *yip! yip!* with the whistle and hangs out of the cab and enjoys himself a whole lot.

Man, but you'd ought to have seen that old wagon teeter! You'd have sworn she was riding entirely free of the trucks. I was expecting we'd go under her every minute. But all old John does is sit back and whale the blooming stack off the mill.

Even at that, though, everything might have held if it hadn't been for No. 2, eastbound accommodation. When the hog up ahead swung past the loop just down this side of the station at the branch, No. 2 pops into sight around the bend from the opposite direction and makes the station stop.

The hogger on No. 67 hasn't got time for anything but wing her, forgetting for a minute to whistle a *whoa!* And you have to stop both ends or things are liable to happen.

We kept right on coming. And about that time the slack began to run back on us!

Man dear, but you'd ought to have seen the activity up on the front end of that buggy! There were lanterns and dark forms and little blue halos climbing out into the night up there till the air was plumb full of the fastest action you ever saw.

Our big freight-puller stuck her nose in the back door of No. 67's old red hack and went through said caboose as if it was so much pasteboard.

And they tell me that with the flying start he got, our friend trainmaster only hit the tops of two scrub-oaks in running a quarter of a mile. Just the same he was a whole lot wiser bird before he got his second wind, or I miss a bet.

Furthermore, it was the last time a consolidation did any helping from the tail-end on that pike.

THE BRASS-POUNDER.

BY R. O'HEAD.

DAYLIGHT finds me quartered on a way-wire
(And mostly these are but a streak of rust)
Working with raw novices who never
Learn to wait their turn, or to adjust.

Often to my key or to my vibro
The iron thread has thrilled with speed set free,
As out across the valleys and the mountains
I flung great news that came from o'er the sea.

And often have I felt the throbbing impulse
Of current struggling onward through the coil,
Freighted with the grief that heralds mourning:
(I stayed a message once—one's key needs oil!)

I remember once the wires all were fogbound;
The tongues of brass lisped slowly what got through:
With cautious ear I gathered from the darkness,
The news the morning paper brought to you.

MAKING DAYLIGHT ON THE TRAIN.

Illuminating Engineers Have Had to Solve Many Puzzling Problems in the Evolution from Oil to "Juice."

RACK BRAINS TO SAVE TRAVELERS' EYESIGHT.

Three Common Systems of Car-Lighting Are the Storage-Battery, Axle-Dynamo, and Head-End Methods—Disadvantages in All—"Visual Plane" Offers Difficulties—Interesting Facts about the Headlight and Placing of Locomotive Numbers.

BY THEODORE BENTON.

GOOD things, in the interval between the time when they are discovered and when they are applied, often take a rest-cure. Had Franklin's life-span been extended till the beginning of electric illumination of railway-cars, he would have ridden under oil-lamps for some time before the idea of employing the mystic element he coaxed from the heavens was even thought possible for train-lighting.

Oil the Illuminant as Late as '98.

For instance, in 1898, despite the advance made in car lighting by gas or electricity, kerosene or some form of petroleum product was used to illuminate 27,000 of the 30,000 cars then running on passenger-trains.

To be sure the lamps were vast improvements over the dirty, dim, flickering affairs of the 60's, but oil was still the chief illuminant, and experiments with gas and electricity were in the early stages. Since then progress has been remarkable, and America has in this field, as well as others, fairly outstripped Europe.

At that time, too, Europe was using vegetable or animal oils that leaked and smelled—not to heaven, elsewhere. A traveler in France in the middle 90's wrote home that the flame of the car-lights smoked to an extent which made the interior so dim that passengers could not distinguish each other. The lighting service in America was superior to this.

While most laymen thought the oil generally used was kerosene, it was in reality a far heavier oil of difficult inflammability, producing a flame sensitive to draft or jar. A fall would extinguish it.

During the earlier years of railroading there was a great evolution in lamps. Even those of the middle 80's were a great contrast to the smoky and ill-smelling burners of the first days.

One of the first improvements over the plain, flat-wick burner was the familiar Argand burner, that had the advantage of giving a strong draft and a hotter and brighter flame. The Argand burner, named after its inventor, was then in household use as well as in public buildings, railroad trains, *et cetera*. It was a circular burner,

giving a strong flame, which, however, had the disadvantage of being "jumpy."

Another improvement that won special favor was the duplex or dual burner where two flat-wick tubes united to form a single flame. This was all the more welcome because, with 300 degree oil, which is less fluid than ordinary kerosene, the lamp more frequently grew dim from the sluggish flow of the oil than from the lack of oil supply.

But the greatest improvement over the old styles of mineral-oil burners was made in the invention of the central-draft burners. These also gave a round light, with the improvement of a flame-spreader, a round metal disk over the light which distributed the illumination more evenly through the car.

A horizontal bar of metal sustained two of these lights in railroad-cars.

While manufacturers were introducing improved oil-lamps, in the latter part of the old century, inventors were busy experimenting with electricity, gas, and the other methods of train-lighting, some discarded and some now in general use. The problem of electrical lighting, being a hard nut to crack, roused the combative spirit of man simultaneously in America and Europe.

Experiments in Electricity.

The most progressive railroads in the United States and Europe financially assisted inventors who wrestled with the problem of designing a commercially successful system. The experiments met with much public favor because of the cleanliness, safety and freedom from odors of the "new order."

The great difficulty encountered lay in furnishing current to the lamps uninterruptedly, whether the train were running or standing still, when the locomotive was detached, or even when cars were separated from each other. And to solve this problem inventors sat up till cold gray dawns and felt like mornings after.

From the beginning experiments were conducted along these differentiated lines: primary-battery system, storage-battery system, direct dynamo, combined dynamo, and storage-battery and track-wire system.

As in the case of lighting by lamps, European standards of progress in electric car-lighting were in those days much lower than those in America. Experiments over there were pronounced satisfactory that were instantly condemned on this side of the Atlantic because of the dimness of the light produced.

It was early determined here that the primary battery could not possibly compete with other methods of generating the current. But that system was repeatedly tried abroad.

One train ran for nearly a year between Paris and Brussels "lighted" by electricity from bichromate batteries. The quotation-marks are used with malice prepense.

The Track-Wire System.

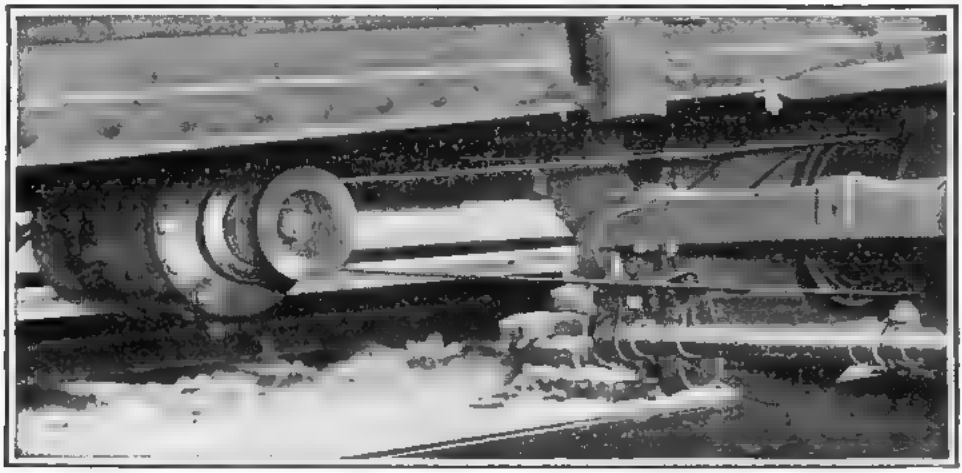
As for the wire system, furnishing electricity to the train from a wire along the track, American railway officials early decided this method not generally desirable for railway service. They conceded its value to elevated and straight electric systems, but discarded it as an ambitious first lighting aid to steam roads.

Upon one railway in England and one in Russia, however, this system is in operation for lighting trains while passing through tunnels. To Americans this seems like circling to a straight end. Instead of wiring and equipping with lamps a hundred or more cars merely to light them while passing through a tunnel, it would seem cheaper and better to light the tunnel.

The first instance on record of electric lighting of a railway-car was on the London, Brighton and South Coast Railway, in England. In October, 1881, a palace-car on this road was fitted with storage-batteries and run between London and Brighton. The batteries were charged during the night at London by a special engine and dynamo.

The system was soon extended to the lighting of entire trains. However, the inconvenience of charging the batteries at the station brought about a modification of the system by the addition of a dynamo driven by the car axle.

In August, 1882, some Faure accumulators, brought to this country from France,



A MODERN AXLE-DRIVEN CAR-LIGHTING GENERATOR THIS TYPE IS MOUNTED ON THE CAR-BODY AND NOT ON THE TRUCK, AND HAS A COMPENSATING DEVICE FOR TRACK CURVES.

Photo by courtesy of the Safety Car Heating and Lighting Company.

were tried for a few days in passenger-coach No. 397 of the Pennsylvania Railroad. This was the first instance of electricity being employed to light a railway-car in this country, and one of the first in the world.

Experiments were made somewhat earlier in the same year on the Paris, Lyons and Mediterranean Railway in France, where a train was lighted with twenty-candle-power Swan incandescent lamps. The whole trainful, by the way, would have just about sufficed to light fairly well one American sleeper of the early 90's.

This French Swan system obtained its current from a Gramme dynamo driven by a belt from a pulley on the car-axle.

Heyday of Storage Batteries.

After the Pennsylvania's early experiments, public belief in America was that when the storage-battery was somewhat improved it could be successfully used for electric car lighting. In the summer of 1884 experiments were made at Altoona, under Dr. Dudley's direction, with a Brush storage-battery.

Such success was achieved that eight parlor-cars were equipped with incandescent lamps and put in service April 1, 1885. Seven more cars were fitted with the system in May, 1889.

In 1886 two American companies began pushing the storage-battery, and in 1887 several railways began the use of electric-lighting from storage-batteries on a big scale. The Boston and Albany began lighting a Boston suburban train with a current from Julien batteries in January, 1887, and on March 29 two express-trains between New York and Boston were completely equipped with electric light.

Cars Lay Over 10 Hours to Recharge.

Each car had twenty-two lamps of sixteen-candle-power each, and a sixty-cell battery weighing about a ton. The batteries were charged without removing them from the cars, so each train had to lie at either terminus for about ten hours while this work was being done.

Nothwithstanding difficulties and expense then existent, railroad men beheld literally a bright future for electric train lighting. G. W. Blodgett, then the electrical engineer of the Boston and Albany, in a paper read soon after these trains began running, said: "In the near future it may be reasonably certain that electric lamps in the cars will be as common as the air-brake and Miller platform."

Several other railroads followed the lead of the Boston and Albany, and ran into excessive first cost and ensuing expense of maintenance. The greatest delay was in exchanging the spent batteries for the charged ones.

The Boston and Albany abandoned the

system in the fall of 1889, after two and a half years of trial. A few years thereafter no American cars save a few parlor-cars of the Pennsylvania were lighted by this means.

Direct-Dynamo System Comes In.

The direct-dynamo principle of lighting trains dispensed altogether with storage batteries. Electricity was furnished to the entire train from a dynamo placed at some point on the train and run by a small steam engine. The Paris, Lyons and Mediterranean pioneer train previously mentioned employed this power system, and it was also tried on a German railway and on some English lines.

The Chicago, Milwaukee and St. Paul road took it up on this side in 1889. The engine and dynamo were placed in the end of the baggage-car, or in winter in a separate car designed especially for them.

The apparatus was started running as soon as a train was made up. Each car was equipped with an auxiliary outfit of oil lamps. With this system the old-time danger of the oil spilling in case of an accident to the train was still present, of course.

The Chicago, Milwaukee and St. Paul equipped sixty-two cars with this system and found it more satisfactory than the combined storage battery and dynamo system they had tried out previously. This system was pronounced the cheapest for through express-trains where the cars were coupled together for long distances. For trains making runs of moderate length, with frequent cut-outs of cars, the item of expense counted heavily.

Combined Storage Battery and Dynamo.

In the early 90's this system, the combined storage battery and dynamo, was in more extensive use for train electric lighting than any other. It was susceptible of much variation, according to whether the dynamo or the storage battery were made the prominent feature.

The batteries could be put in one place; the system permitted the introduction of the dynamo to keep the batteries charged and avoid delays at terminals, and sometimes, too, the batteries were distributed to each car and arranged so as to keep the lights burning when the car was cut off from the train.

From the first the Pullman Company led the way in the installation of electric light for railway cars in this country. It early introduced the storage-battery system to light two of the Pennsylvania limited trains between New York and Chicago.

The company started with the storage-battery system. Small storage batteries were placed under each car, rendering it independent in case of necessity, and installed a dynamo and engine, taking steam from the locomotive boiler, in the baggage-car, to keep the batteries charged and to light the train.

In those days this was agreed to be the best system, but as then conducted it was found to cost too much, and the years went merrily winging along, solving the problem through applied experiment and gradual progress.

Dry-Carbureter Process Had a Try-Out.

To leave the "mystic juice" for a few moments and hie to other car-illuminants of the old days, a device that found a ready welcome and try-out from various roads was the Frost Dry-Carbureter Process.

This involved the using of air charged with the vapor of gasoline as an illuminant, and consisted of a device for passing air under slight pressure through a chamber packed with cotton wicking soaked with gasoline, and thence passing it as quickly as possible, and with as little change of temperature as feasible, to a burner where it was consumed like other gas

The Pennsylvania Railroad Company experimented with it in the spring of 1884, and many improvements were made in the process after the experiments were made on that road. The first railway car in the country to be equipped with that light was on the Pennsylvania.

In the early 90's the Pennsylvania had some 250 cars equipped, and eleven other roads were also using it. The Pullman Company had also started experimenting with it. In 1891 thirty roads were employing it.

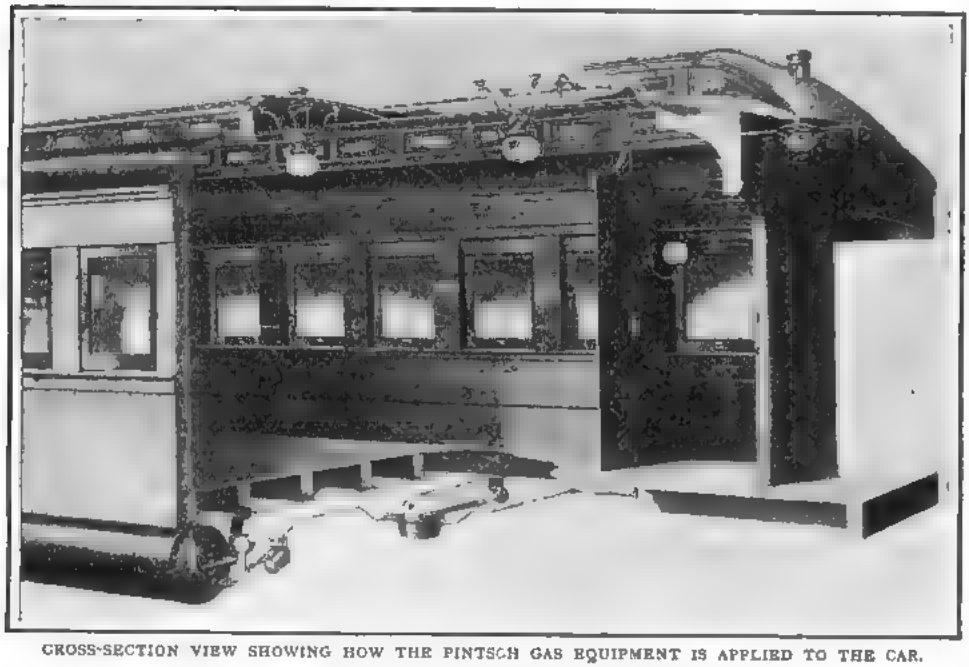
It was subjected to some severe tests in exploiting it for the attention of railroad magnates. The manufacturers used to drop a weight of 2,079 pounds from a height of 33 feet 4 inches on the carbureter and crush it. Then they would drop the weight again, with an impact velocity of 30.6 miles per hour.

After these two biffs the carbureter would be generally unrecognizable as such, but the big point gained was that usually not more than a quart of the four gallons of gasoline contained in the carbureter would be squeezed out by both blows. The wallops, of course, were intended to approximate the raps that the carbureters would be apt to receive in a wreck.

Some systems of the nature above described played in hard luck. The vapor escaped and fire started above the passengers' heads. There were some panics and minor casualties from this cause, but no fatal eventualities, so far as the present writer's research found.

In figuring on the cost of lighting systems the Pennsylvania stated publicly in the early 90's that on the average for the whole year cars in service are lighted for three hours per day—four and one-half in winter and one and one-half in summer. As cars on long runs are lighted all night, there is much inequality of expense among the different cars.

To the great lay mind, particularly that portion of it that has attained the maturity of years, the term "Pintsch light" is as well known as that expression rampant in baseballdom, "the pinch hitter." Yet probably few know much of the origin of this method of train-lighting that won so much favor both here and abroad.



CROSS-SECTION VIEW SHOWING HOW THE PINTSCH GAS EQUIPMENT IS APPLIED TO THE CAR.

Photo by courtesy of the Safety Car Heating and Lighting Company.

Pintsch gas is a German product. This oil-gas system of car-lighting uses a rich gas made from crude petroleum as the illuminant. The gas is made at central stations and compressed in receivers from which it is piped into cylindrical steel tanks placed underneath the car. From these it is drawn as it is needed for use in the car-lamps.

An ordinary system of gas piping and burners is used, modified only in this respect; that to make such rich gas burn to the best advantage it is necessary to burn it on the regenerative principle; that is, to heat it before burning.

This system, devised by Julius Pintsch of Berlin, met with quick favor both abroad and in this country, stood the test of time and experience, and forged ahead in popularity along with electricity. It came rapidly to the front during the middle and later 80's.

The early stations attracted much attention from experts. The receivers installed by the Erie Works at Jersey City in the 80's each contained 265 cubic feet, and with a ten-atmospheres pressure it held enough to fill about twenty cars.

The cost of the system of distributing pipe was not great, as the excavating embraced only a shallow trench deep enough to protect the pipe from injury. In passenger-train sheds the distributing pipes were often run overhead.

The Pintsch Company, aggressive for business, and anxious to avoid all danger in the introduction of its system, early prepared rules for the instruction of car fillers. One of these provided for the use of a safety lantern whenever artificial light was required for filling the tanks.

Pullman Put In the Pintsch Light in '90.

Pullman cars running from Chicago to New Orleans as early as 1890 were burning a dozen lamps fed by four large reservoirs. From then on various lines rapidly began experimenting with the system and many installations followed.

A point that rendered the system popular from the beginning was an evenness of illumination that was in those days absent from most systems of lighting then in experimental stages. The regulator did it. By its use the pressure of the gas in the pipes was maintained at a half-ounce whether the reservoir was full of gas at 150 pounds pressure or nearly exhausted.

These regulators were warranted for five years, but when the system was being generally installed by American roads it was reported that some had been in use for sixteen years in Germany without repairs.

The application of compressed oil gas for the lighting of railway carriages was first tried in 1871 on the Lower Silesian Railway in Germany. It was installed on the St. Johns Wood trains of the Metropolitan Railway in England in 1876. The Great Eastern Railway was the next to adopt it and then other companies flocked in.

Valuable tests have been made by railroad experts to determine the comparative photometric value of oil, gas, gasoline and electric lights employed in car lighting.

Here is the proposition, shorn of the many-syllabled technicalities employed by experts: what we wish to know about car lamps is the relative amount of light which they make available in the visual plane of a car; that is, the plane in which a book or other object on which illumination is needed is held by an average passenger.

The Puzzle of the "Visual Plane."

This plane is about 4.5 feet before the car-lights when placed at their usual height. To represent the intensity of the light supply along this plane, you must introduce some other unit than candle-power of the whole lamp. So the experts added the visual unit of one candle-power at a distance of 4.5 feet.

They tell us that the light derived from lights which the passenger is facing is worthless to him, or worse. They make it harder rather than easier to read or see about the car. In less degree this applies to the rays coming vertically downward, because a book or other object in the visual plane, on which light is needed, cannot be held so as to be perpendicular to all the rays which reach it from a series of lamps. The book is naturally held at an angle of about 45 degrees to the vertical.

Experts agree that the candle-power of any oil lamp is greatly affected by the skill and care shown in managing it, adjusting the wick, etc. In this owlish bit of subtle decision the mere layman will have no trouble in following the expert.

The men whose life business it is to dissect illumination, however, make this point as introductory to the statement that an oil lamp under test is likely to show much more candle-power than will the average of 100 burned in service. Likewise, all the systems of railroad gas-lighting show less candle-power in daily service than under the skilled manipulation given them while under test.

Some gas and gasoline systems require occasional brushing and cleaning and fluctuate quite a little in candle-power. A number of gas systems tested have been found to be defective in distribution of light. Much of the light is wasted on the carpet and walls of the car without doing the eyes of the passenger any appreciable good.

Plenty of light on the book and as little as possible elsewhere has been the line laid down for years by the railway illuminating engineers, and it is the object for which all of them are working.

It is conceded that, especially in electric car-lighting, there has been in America for the past few years a substantial improvement in steadiness and comfort, though even now there is still some inevitable fluctuation, caused mainly by the jar and motion of the train.

The ambition of the inventors and engineers alike is to produce a car-light as steady and helpful to the eyes as is the up-to-the-minute library-light at home, and here in America they are much farther toward that ambition than in Europe. Travelers agree that the average car illumination in the United States is far more satisfactory than that found on the great majority of the English and continental lines.

Advice to Night Readers—Don't!

The advice of oculists to the traveling public, however, gathered from some library references, is that passengers on other than the best appointed trains confine their nocturnal reading to a minimum. And on many of the indifferently equipped roads in the country, to indulge in this reading under the old-style oil or gas-lamps is wholly injurious to the eyes.

American railroad men have the reputation of leading the world in the item of studying ways and means for the comfort of their passengers, and this question of car illumination has received fully as much attention as any. A few years ago an interesting discussion was held by the Western Railway Club of Chicago on the topic of "Exposed *vs.* Concealed and Semi-Concealed Car-Lights."

The point was made that a common defect in car-lighting was the glaring effect of lights of high intrinsic brilliancy, this being particularly noticeable when a passenger occupied one of the rear seats and the entire line of lights, the length of the car, coming within his range of vision, shone in his eyes.

The trouble with such a situation was that the light reached him at such an angle that the eye was unable to protect itself, through the peculiar construction of the optic, the difficulty being aggravated by the fact that the roof of the car was low and so the lights were not at a great distance above the passenger's head.

The point was illustrated by citing snow-blindness, which affects the eye not because the intensity of light is stronger than the light which comes from above, but because it enters the eye from a direction from which the optic cannot possibly protect itself.

Abolishing the Shadow-Dance.

The problem discussed at that conference was one upon which illuminating engineers of recent years have been consistently working. It is to enlarge the area of the light source and to produce a softer light.

It is unpleasant, when one is reading in a car at night, to have the lights situated so that the shadow of the passenger's head comes directly on the page. And engineers and lamp manufacturers have welded their forces to chase away this shadow.

They have worked to achieve this aim, along electrical lines, through the installation of incandescent lamps of low voltage, some with frosted globes and some with clear ones. In one instance a steel diffusing-screen, placed above a row of incandescent lamps, the steel finished with a white enamel, reduces the harshness of the lighting.

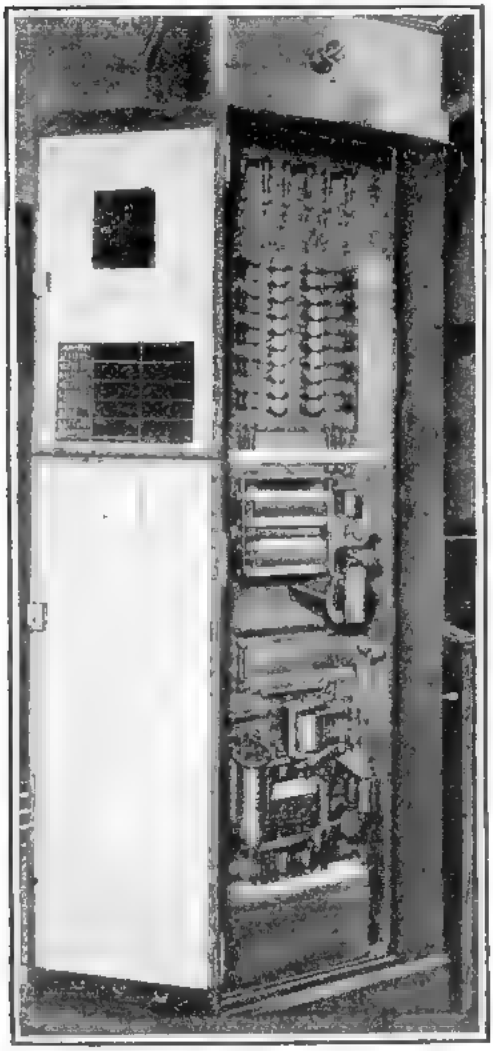
The end of the first decade of the twentieth century found in common use among American railroads three principal systems for the lighting of trains by electricity: the storage-battery, axle-dynamo and head-end systems.

The first involved the straight battery charge as in the old days, but with simpler

means, a saving of time and money made possible through modern improvements The second method lighted the car as an individual unit by means of a small generator which took its power from over the truck-axle.

The third, or head-end system, called for the maintaining of a small electric power-plant, to be run by steam from the locomotive, and located either on the baggage-car or on the locomotive.

On some roads no auxiliary batteries were carried and resort was had to Pintsch gas or oil lamps to tide over the gaps. On one road a full set of batteries was carried on each car.



DYNAMO AND LAMP REGULATOR CARRIED IN THE LOCKER CLOSET OF A MODERN PASSENGER-CAR

Photo by courtesy of the Safety Car Heating and Lighting Company

Another line solved its problem by carrying two sets of batteries per train, one set being located in the baggage-car and the other on one of the last cars of the train. This plan was made to light both halves of the train when the dining car was being cut out.

With the head-end system, in order not to have an excessive voltage drop and consequent dimming of lights in the last half of the train, the three-wire loop system of wiring was necessary, and in order to take care of twelve or more cars 4-O wires were commonly used.

Upon the question of uniformity of voltage in the lamps, the head-end system was given first choice by experts for generally satisfactory service. The axle-dynamo system was next, usually showing some variation, and the storage battery plan, in the nature of things, came last, showing a maximum of light at the start and a dimming at the finish

Nevertheless, in recent years, the axle-driven dynamo has gained steadily in favor, and is now regarded by most modern rail roads as the most efficient means of train lighting.

By attaching the dynamo to the car body instead of the truck, and using a compensating device for track curves, the objectionable features of the old axle-dynamo system have been removed.

In addition to which this method has a distinct advantage over the head-end system in that it makes each car an independent unit

In the question of train illumination the locomotive headlight literally shows the way, so, in order to set a pace, we will consider it at the end of this article.

J. L. Minick, in a paper upon the locomotive headlight which won wide attention from railroad engineers, brought out a point of peculiar interest

The usefulness of a beam of light projected by a headlight is largely dependent upon whether the local contours of the earth's surface are such as to permit the beam being seen at the maximum distance.

In the East, where railroads generally follow the course of streams in order to pierce the mountain districts at a reasonable grade, the tracks are seldom straight and the beam loses its usefulness. In the West, across the great plains, the track can be laid straight, but the curvature of the surface approaches closely the true curvature of the earth.

The average height of the headlight above the rail is about ten feet. If the observer's eye be placed at the focal center of the headlight, the horizon will be at a distance of 4.18 miles.

The height of the eye above the rail of the average man standing on the ties is approximately five feet and the horizon to him will be at a distance of 2.95 miles. The sum of these two distances, 7.13 miles, is the distance at which the beam from a headlight ten feet above the rail can be seen by the average man where the earth's surface has a spherical shape.

Where the earth's surface is flat, or there are dips in the track, it is possible to see for a distance of twenty or thirty miles. A beam of five hundred apparent candle-power can be seen twenty-five miles in rainy weather and ten miles farther in clear weather.

In the case of a limited express-train running at sixty miles an hour, a time allowance of twenty minutes or more between the first warning and the arrival of the train should be ample for the protection of both the public and employees.

Where to Put Locomotive Numbers.

Considerable experimental work was done in Schenectady to determine the best location for locomotive numbers on a headlight.

Headlights have been tested with the number plates in front, on each side and also at an angle. As these flying numbers need to be read by train despatchers, towermen and others, the question was given serious attention.

It has been found that very satisfactory results can be obtained with number plates located approximately thirty degrees to the face of the headlight, extending back from the front of the light. This enables satisfactory reading of the numbers, both from in front of an approaching locomotive and also from the sides as the engine passes.

In fact, declare leading experts, this arrangement allows a longer period for determining a locomotive number when an engine is approaching and passing a towerman than any other arrangement tried.

Interesting Tests.

There has, of course, been no end of experimenting with the big "spot-light" or "bull's-eye" at the head of the rushing train. There is no need to recount here the difficulties which railroad heads have had to meet through the lawmaking of legislators who knew nothing of the practical side of the question, and acted upon theory distinctly juvenile in its ignorance.

However, some States have gone about this question in a common-sense manner by employing hard-and-fast tests. There was Nevada, for instance, which conducted tests at Reno.

These tests showed that a 140 candle-power incandescent lamp, with a considerable reflector, was able to illuminate a track so that objects thereon and alongside could be seen at a greater distance than with an arc headlight commonly used on the 1,500 candle-power specifications. In this case the test prevented the adoption of a wasteful and arbitrary standard, but in some other States the railroads have not been so fortunate. Legislatures needlessly cost railroads, in this and many other respects, many dollars.

Tests for the American Railway Master Mechanics' Association, conducted at Columbus, demonstrated beyond question that an opposing headlight having an apparent beam candle-power of over 3,000 tends to destroy the accuracy and likelihood of picking up danger-signals, and that the accuracy of picking up these danger-signals decreases rapidly with the increase of the apparent candle-power of the opposing headlight.

The association recommended that a headlight should not have an apparent beam candle-power over 3,000 or less than 500.

THE LANGUAGE OF THE TRAIN-WIRE.

It Takes a Good Man to Hold Down "DS's" Job, and Stand for all the Interruptions He Has To.

BY LEROY PALMER.

WHO, outside the telegraph fraternity, has not listened to the nervous clicking of a telegraph instrument and experienced the desire to know the meaning of the mysterious metallic signals? Perhaps, as a passenger, you have sat in the railroad waiting-room at some small station and heard a single instrument in the operator's office; the sounds at times slow and irregular, again fast and continuous, then stopping altogether for a moment, only to start again, clicking away faster than ever, as some "gilt-edged" Morseman manipulated his key at a distant point? What railroad operator has not often heard train conductors say:

"Well, I wish I understood that instrument. I'd tell that despatcher a few things!"

In telegraphy, a separate signal is used for each letter and figure; truly, "every little click has a meaning all its own." And as on a train-wire the saving of every second of time counts in the movement of trains, a code of abbreviation, which is almost a language in itself, has come into use.

Almost everything is abbreviated except the actual wording of train-orders, and even for them there are the standard abbreviations, like C&E for conductor and engineman, Eng. for engine, No. for number, *et cetera*.

In every-day work on the train-wire, abbreviation is so much used that student operators have trouble for months in "getting what he said" when the despatcher snaps out, "Sa wn u c em cmg ma hv 9 r em" ("Say when you see them coming; may have orders for them"), or "Tell hm gt in on sdg & sta tr 7 b tr abt 10 mns" ("Tell him to get in on the siding and stay there; No. 7 will be there in about 10 minutes").

During the winter of 1914-1915, when telegraphers by the hundreds roamed over the country, ready to take anything in the shape of a job, an old B. & O. man was "out in the cold." He had never done anything but "pound brass" in a railroad office, but being a "millman," as a typewriter-telegrapher is called, and being also well supplied with nerve, he applied in person in answer to an advertisement for a first-class stenographer. His appearance was good and he was given the place.

In relating to me how he "got by" he said all he used was the railroad code. When the boss one day asked him what system he used, he replied with a grin, "The Baltimore system." Expert stenographers may doubt the truth of this yarn, but at least the old boy held the job long enough to get a few square meals inside of his lean flanks

So even if one could interpret every sound of the rattling instrument, he would not know "what it was all about" without a knowledge of the abbreviations.

Railroad men generally appreciate the weight of responsibility borne by the train-despatcher, who is held accountable for the safe and prompt movement of all trains on his district, but few, even the operators who are his assistants, realize the nerve-racking strain he endures, owing to the constant interruptions of circuit "breaks" into his work by operators asking various ques-

tions, many of which are unnecessary or could wait until the circuit was not in use.

Little wonder that "DS" is peevish at times! Could you read the mysterious clicks of the train-wire sounder on a day when business was brisk, you would hear something like this:

DESPATCHER (*At Division headquarters, calling operator at Springfield*)—SG SG SG DS SG SG SG DS.

OPERATOR AT SPRINGFIELD (*Answering*)—I SG.

DS—Hr 19 cpy 5. (Meaning: Make five copies of a train-order on Form 19.)

OPR. PARKVILLE—PK. (*Breaking in*)—7 smkg ny tng r em (No. 7 is smoking—*i.e.*, coming near enough to see the engine's smoke—will you have any orders for them?)

DS (*To Opr. PK*)—Es cy 3 mn. (Yes; make 3 copies of a train-order in a minute.)

(*To SG*)—Cy 5 u & FV FV FV DS. (Make 5 copies, you and—*Suddenly breaks off to call Fairview and several other offices.*)

(Sending address of train-order to offices called)—

Order No. 71.

To SG to C&E No. 64 and Extra 2241 east.

To FV to C&E No. 17.

To RY C&E Extra 2218 west.

HN C&E No. 21.

(Sending the order proper)—

No. 64 take siding meet No. 17 at Bolton extra 2218 west at Fairview—

OPR. PK *(again breaking in)*—7 close cmg fast.

DS. (*to PK.*)—OK ty sta tr r 18 9 mn. (OK. They stay there for No. 18. Orders in a minute.)

(To SG and others waiting)—

—at Fairview and No. 21 at—

OPR. CLEARWATER — CR. (*Breaking in*)—Is 18 OT (Is No. 18 on time?)

DS. (*to C R*)—Es OT. (Yes, on time.)

(To SG and others waiting)

—and No. 21 at Pierce. Extra 2241 east meet extra 2218 west at Rockton. JJF *(Superintendent's initials).*

(*Each operator then repeats the order to despatcher.*)

OPR. FV *(to DS)*—17 rede con ses tt meet wi 64 gg stab hm 10 mns at BN. (No. 17 is all ready. Conductor says that meet with No. 64 is going to stab—delay—him ten minutes at Bolton.)

Ds (*to FV*)—Art Ill chnge it tn cn u c tt ex et. (All right; I will change it then. Can you see that extra yet?)

FV—Es abt mi & hf et. (Yes, about a mile and a half yet.)

DS *(to SG)*—Has 64 sined tt 9 et? (Has No. 64 signed that order yet?)

SG—Es.

DS—OK 31 cpy 3 u & FV Ord 112 to SG C&E 64
FV No. 17

No. 64 meet No. 17 at Porter instead of—

OPR. SLEEPY HOLLOW—SO. *(Breaking in)* Is 18 OT?

DS—*(to SO)*—Es kp out hr. (Yes, keep out of here.)

(*to SG and FV*)—at Porter instead of

OPR. SUNNY RIDGE—SR. *(Breaking in.)* Con 44 wants no if hes to gt t mtys at Pit. (Conductor No. 44 wants to know if he's to get the empties at Pit.)

DS *(ignoring SR—to SG and FV)*—at Porter instead of Bolton JJF.

OPR. SR *(again breaking in)*—Con wnts no so cn set out peddlers b 4 18 gts hr if ty ny late. (Conductor wants to know so he can set out the merchandise-cars before No. 18 gets here, if they are any late.)

DS *(to SR)*—U tell tt condr to kp tt trn o his in hole 18 OT & wnt hm sta tr r a stk ex mo 9 sn. (You tell that conductor to keep that train of his on the siding. No. 18 is on time and want him to stay there for a stock extra; more orders soon.)

OPR. PK—OS PK 18 bi 213 fix 7. (OS—*i. e.*, train report—No. 18 by PK at 2.13 P.M. Give No. 7 their orders.)

DS—OK 19 cy 3 u & BO BO BO DS BO BO BO DS. (OK Form 19 order. Make 3 copies you and BO.) *(Calls BO five minutes, with numerous interruptions.)*

OPR. HANSEN (HN)—Hows 7? (How is No. 7?)

DS—Ty OT rite nw bt ty nt gg b if I dnt raise BO pty qk. (They are on time right now, but they are not going to be if I don't raise BO pretty quick.)

BO *(Sleepily)*—I I BO.

DS Well wr u bn? Btr wk up or stick rnd tr wr u cn hr ts call. Bn after u 15 mns! (Well, where have you been? Better wake up, or stick around there where you can hear this call. I've been after you for 15 minutes!)

And so it goes, hour after hour, day and night; orders swiftly sent and repeated; instructions snapped out in quick abbreviations; the sounder almost never still when traffic is heavy.

Occasionally sallies of humor by despatcher or operators break the strain and monotony and railroad slang is used because it is more practical than Webster. The telegraph is rightly called "the nervous system of the railroad." The abbreviations of the train-wire are the impulses that direct the movement of traffic. And by these clicks of the sounder are trains of all classes—from the drags of coal and lumber to the electric-lighted limiteds, with their load of human lives—sent rolling in safety over the bands of steel; held back at the right moment; shunted in on sidings, started again and rushed to the limit of speed—even as the sounds of the instrument reach your listening ear.

THE COMMUTER AND HIS TICKET.

BY HENRY I. MYERS.

MY commutation-ticket has been punched all full of holes.
Conductors do not realize that tickets may have souls.
But *I* know (and the ticket knows) that such is not the case:
There's meaning in each punch-hole in its travel-punctured face.

For each conductor has a mark that is his very own;
By crescent, circle, spade or square his handiwork is shown.
Each mark relates a story of a trip to East or West—
A story that the ticket holds within its paper breast.

This oblong tells about the trip where first I saw my sweet;
This square reminds me of the time I offered her my seat;
This diamond is the journey where I looked into her eyes;
This arrow is the morning when we only spoke in sighs.

This double-star reminds me how a trip for life was planned;
This circle was recorded when I asked her for her hand.
The ticket's month expires there, but I shall not be vexed,
Because its little story is continued in the next.

And when I bring my bride to town, I hope they punch a heart,
And when I bring her home, they ought to punch a Cupid's dart.
Then later, when I ride to work, to earn her bread and mine,
They'll wish me luck and fortune if they punch a dollar-sign

And if success rewards my daily business-trips to town
(Which fact will be recorded on my ticket by a crown),
Perhaps a few years afterward the trainmen of the line
Will find a group of little tickets traveling with mine.

With *the* Inventors

SURVEYING the broad field of invention, we are struck with the fact that it is not always the expert, nor the head of a particular business, who contributes most that is new in that business. There is a decided tendency on the part of manufacturers to standardize their products and to resist change, for it is more economical to make standard parts, with standard machinery and labor already broken in, than it is to enter new fields in pursuit of the elusive idea. If the manufacturer had his way, he would make few changes in the quality of his output, and the quantity alone would change.

This tendency to resist change is just as evident in railroading as it is in any other branch of manufacturing. There is always the fear that alterations may lead to trouble of one kind or another.

An attempt to enlarge a single part of a locomotive probably means that the adjoining part must either be moved or made smaller; or, if these alterations are impossible or undesirable, there is the possibility of moving a part farther on or diminishing its size to make up for the lost space.

There are hundreds of dimensions that may have to be changed just on account of one little alteration in a seemingly insignificant part. No wonder, then, that the builders of locomotives dread changes.

A locomotive in the process of being designed is laid out with a hard, knife-edge pencil on extra heavy drawing paper, a favorite scale being two inches to the foot, although a 1½-inch scale is sometimes used for the largest engines. Only an experienced designer who has been with the company a number of years is entrusted with this work, for it has to be very complete and drawn with extreme accuracy.

Wheel-centers are spaced off with great precision, and the boiler, the fire-box, the cylinders, the reversing gear, and many other parts, with their supports and stays are drawn in and carefully inspected to make sure that there is no interference. So complex is this first or master drawing that the novice looking at it sees only a maze of meaningless, fine lines that intersect and run hither and thither.

And just as the drawing is nearing completion, word comes to the designer that some inventor has brought out a new furnace, and that the purchaser of the locomotive insists upon substituting this furnace for the one originally intended.

Can the alteration be made without difficulty? Well, not exactly. Only about a hundred lines must be rubbed out so completely that they cannot possibly be seen, and then the improved furnace is drawn in and found to interfere with nearly everything around it, necessitating many other alterations of size and shape and position.

But the inventor has won his point, and against great obstacles And inventors with good ideas will always win against all obstacles, great and small.

Have you a great idea? Nourish it, develop it to its fullest extent, and then loosen its fetters that it may go forth and soar above the heads of doubting men, to find a resting place amid the green foliage of the tree of life, to add to that life, and make it pleasanter to live. That is the rôle the inventor should play.

ELECTRIC LOCOMOTIVE.

THE Eaton electric locomotive is in two sections or half-units, having the effect of articulation, and, in fact, the engine can turn curves more readily than the articulated type of steam locomotive.

Each section has two electric motors, situated near the center and geared to a common counter-

shaft having connecting-rods to the drivers. The motors are located quite low, producing a low center of gravity, but as the side-thrust preventive device is equally low, the effect upon the rails is negligible, the thrust being converted into a slight rolling movement of the locomotive body upon its equalizing system.

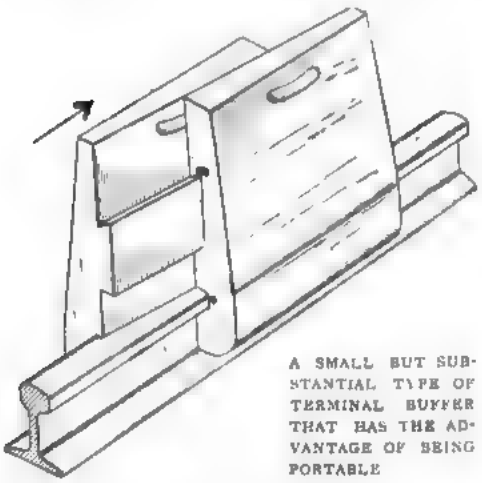
Among the qualities of the locomotive are power and high speed, and it is particularly adapted to handle the heavy and congested traffic of a terminal railroad system. The symmetrical arrangement of the two sections makes possible the movement in either direction with equal ease.

The officials of the Westinghouse Electric and Manufacturing Company thought enough of the design to acquire the patent rights from the inventor, George M. Eaton, of Pittsburgh. The number of the patent is 1,233,329.

THE TERMINAL BUFFER.

VARIOUS styles of buffers may be seen in the switching yards at the terminals of tracks, where it is desired to make it impossible to back a car any farther. Some of these are quite elaborate, and others of a simpler construction; but all are of permanent form, and could not be carried from place to place with any degree of convenience.

There are times and places, however, where a small but substantial portable buffer would be very convenient. Often, on a slag-dump, for example, it becomes necessary to move the dumping point farther on, buffer and all, and to provide absolutely reliable means of stoppage to prevent a car from going over the dump. A device of the kind shown could then be used to advantage.



A SMALL BUT SUBSTANTIAL TYPE OF TERMINAL BUFFER THAT HAS THE ADVANTAGE OF BEING PORTABLE

It will be observed that this buffer consists of two wedge-shaped parts dovetailed together so that they can slide back and forth, but cannot separate on account of the flared projection in the one and the undercut groove in the other.

At first sight it might appear that a blow in the direction of the arrow would loosen the grip on the track, but a closer inspection will show that the sliding movement caused by such a blow would bring the ends of the wedges closer together and lessen the distance through, and hence the grip on the track will only tighten.

Instead of allowing the wheels of a car to come directly into contact with the device, it is better to place a crosstie in front to receive the initial force of the blow.

The patent is No. 1,231,513, issued to R. W. Evans, of Kennett, California.

STEAM AND COMBUSTION ENGINE.

IN designing the locomotive represented by patent No. 1,230,248, J. F. Wentworth, of Rochester, New Hampshire, has thought it desirable to apply the pistons of internal combustion engines directly to the drivers, as is done in the ordinary steam locomotive.

Moreover, since he does not consider it practicable to use a clutch, as with an automobile, he encountered the difficulty of starting the combustion engine at full load.

The difficulty was overcome, however, by making the locomotive partly a steam engine and partly a combustion engine. A steam boiler and cylinders are used to start the train and get up speed, whereupon the steam is shut off and the internal combustion engine brought into play.

The advantage claimed by the inventor is that of increased efficiency. To use his figures, he states that his system has an efficiency of 25 per cent, whereas the steam locomotive is not over 7 per cent.

It has been acknowledged for a long time by engineers and designers that the efficiency of the steam locomotive is very low, and the inventor points out that the immense volume of steam at high pressure required means that the amount of coal burned per square foot of grate-surface per hour is far above the economical limit of the furnace.

In a stationary plant, the coal is burned at the rate of 20 pounds per hour per square foot of grate surface, while in the locomotive 200 pounds per hour per square foot of grate is by no means unheard of. This fact is an important element in the low efficiency of the steam locomotive, and the very much higher efficiency of the internal combustion engine.

AGAIN THE TRAIN-STOP.

C. A. STURM and G. R. Hurlbut, of Portland, Oregon, are the inventors of a new train-stop, described in patent specifications No. 1,218,816, a copy of which may be obtained in the usual way by sending a nickel to the Commissioner of Patents, Washington, District of Columbia.

The inventors, in referring to their device, state that the object was to provide means for automatically bringing a train to a stop should the

engine driver fail to heed a signal set against him. Simplicity in construction and operation are points that have been kept in mind.

A trip placed between the rails serves to engage a shoe on a passing locomotive, and operates the air-brakes and closes the throttle

The trip in its seat between the tracks is raised and lowered by the movement of a semaphore arm near the roadway, the movement being communicated by suitable levers and reach-rods

The shoe on the engine is double, and consists of parallel plates between which the trip passes, contacting with one part of the shoe or the other. This construction is to allow for the transverse shifting of the engine on the rails.

TRUING THE TIRES.

AN improved machine for grinding and truing the flanges and treads of the car-wheels has recently been brought out by J. C. Price, of Wevaco, West Virginia. The patent number is 1,218,459

Mounted on a platform are two standards with journals for a car-axle, on which are the wheels that need truing. Parallel to this axle is journaled another axle on the ends of which are the abrading wheels, consisting of emery, carborundum, or like material.

There are two of these abrading wheels at each end of the axle, one for the flange and the other for the tread of the car-wheel, and as the axle is movable transversely, the entire tread can be ground and trued

When found desirable, the platform may be moved under a car-truck which has been previously jacked up, the wheels to be ground and trued not being removed. This feature might be made particularly useful in connection with the truing of mine car-wheels, as this operation can be carried out without putting the cars out of commission any length of time

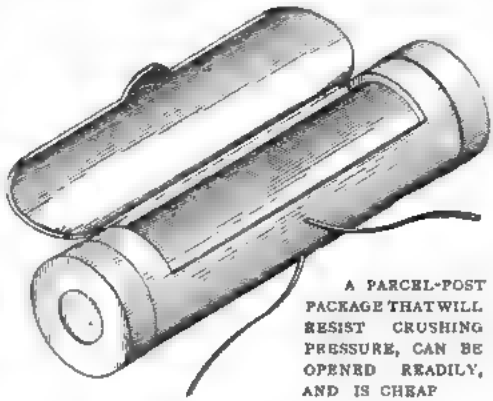
The abrading axle is moved sideways by means of a hand-lever with a slotted yoke engaging pins on a collar movably attached to the axle. An electric or other form of motor rotates the abrading wheels and axle by means of a belt and pulleys.

A PARCEL-POST PACKAGE.

J. A. CABELL, of Savannah, in referring to his patent, No. 1,213,586, says:

> My invention relates to a box or package for the transportation by mail of cotton samples or like soft and yielding bodies, the object of my invention being to so construct such a package that while it will provide an opening of ample size for the ready introduction or removal of the contents of the package, it will effectually resist crushing pressure exerted upon it, can be readily opened for inspection of the contents, and as readily closed after such an inspection, and will possess the essential quality of cheapness.

The body of the box is preferably made of a multiply paper tube, closed at the ends by paper disks that project into the tube so as to provide an internal support. The opening is closed by means of a cover hinged to the body of the box by a tape or other device, and is held in the closed position by a pair of tapes tied together after one has been passed through an eyelet in the cover.



A PARCEL-POST PACKAGE THAT WILL RESIST CRUSHING PRESSURE, CAN BE OPENED READILY, AND IS CHEAP

The idea, though simple, would seem to be capable of considerable extension and used in connection with the parcel-post system

IMPROVED SUPERHEATER.

PATENT No. 1,235,412, issued to Campbell E. Arnold, of Tampa, Florida, covers the design and construction of an improved form of locomotive, and more particularly the superheater as arranged and applied to the locomotive.

The invention includes the functioning of a locomotive in such a manner that steam and compressed hot air may be admitted to the cylinders, or steam alone, or compressed air alone, as desired. The air is supplied by a compressor run by a steam turbine with steam from the engine boiler

The products of combustion in the furnace pass through the funnel-shaped compartment, outside of which is a chamber where the steam and compressed air are admitted for superheating purposes. This admission of the air is controlled by a throttle-valve operated from the cab, and both air and steam pass through the same route from the superheater to the cylinders. From the cylinders the exhaust steam passes finally to the atmosphere through the stack, creating a draft for the fire-flues in the usual manner

SWITCH-OPERATING DEVICE.

THE primary object of this device is to provide a switch for a track and an operating device on a car whereby the switch may be shifted to the desired position by the engineer of an approaching car.

Between the tracks is located a lever with arms projecting toward each side, and it is this lever that throws the switch. The projecting arms are

engaged by trips lowered from the car, one of which is on the right of the car's center and the other toward the left. The engineer depresses the one or the other, according as he wishes to open or close the switch.

The trips on the car are provided with spring buffers that absorb the force of contacting with the track-levers, and prevent breakage or injury to the mechanism. The switch itself is of the ordinary movable-point variety, without complications or additional features. The trips can be operated either from within the car or from the roof, a vertical operating rod being provided that extends from top to bottom of the car and up through the roof.

Devices somewhat similar to this are used on many of the switches of surface lines in the larger cities, and the day is not far distant when the use will be almost universal on street railways, and the application to steam lines will also be greatly extended.

The particular patent described is granted to Michael Detrich, of Cleveland, Ohio, and a citizen of Austria-Hungary. The patent number is 1,220,612.

A WATER SYSTEM.

SOMETIMES we travel through a section of the country where the public drinking-cup is not allowed, and then we realize how nice a cool glass of water really is, especially if there are no paper cups or other drinking devices.

But what a task it must be to fill all the water-coolers in a long train! Often we have watched the operation and wondered if there were not a quicker way to accomplish the feat.

The answer has come at last, and we can now say that the proper way to fill the coolers is by having a pipe-line from the tender.

Not that we need drink the tender water, for that is not always up to the degree of fitness for the ideal thirst-quenching drink. It is possible, however, to place a reservoir on top of the tender and keep a common supply of clear drinking-water for piping to the coolers.

A flexible connection between the cars will, of course, be needed, just as a flexible air connection is required at the present day, but that is a mere detail, and can be attended to by those who solve such problems.

The question of water-supply is a simple matter, and yet every thirsty man will agree that it is worthy of attention on the part of those competent to design water distribution systems. The man who has given the plan considerable thought is Dill Chapman, of La Junta, Colorado, and the reward for his thoughtfulness is patent No. 1,234,625.

BELL-RINGER IMPORTANT.

LOTS of bell-ringers are no good. Some of them turn the bell entirely over, which interferes with the ringing, while others have various defects.

Designers of locomotives will sometimes put a great deal of thought and effort on the other parts, and when they come to the bell will add almost any kind of bell-shaped apparatus that has a rope tied to it. It isn't always the fault of the designer, either; sometimes the purchaser looks upon the bell as an insignificant piece of nothingness.

The small thing is not always the unimportant one, however. The truth is that the bell has saved many a life and been the means of avoiding many a wreck. If an engine is noiselessly backing down a grade onto us, we like to hear that bell in plenty of time.

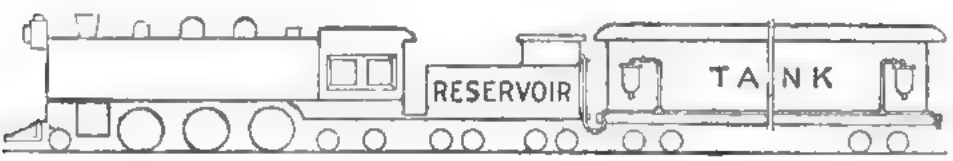
In a recent invention the bell-frame is fitted to the top of the engine as usual, and the yoke supporting the bell is of the ordinary U-shaped type; but there are other features decidedly new. The bell is prevented from turning over by a brake-shoe, which gradually stops the swing, causing it to cease at the proper time.

There is also a pneumatic cylinder and a piston with a connecting-rod attached to the bell-crank, so that the bell can be rung by the compressed air from the braking system. The cylinder is provided with an automatic air-port, and the bell continues to ring as long as the air is turned on, and needs no further attention.

This ringer is a device patented by John Howe, of Aurora, Illinois, and the patent is No. 1,231,357.

DON'T ASK FOR ADVICE.

THIS department does no more than describe patents already taken out, and occasionally suggest new developments. WE CAN'T PASS ON THE MERITS OF INVENTIONS, WHETHER PATENTED OR ONLY PROJECTED.



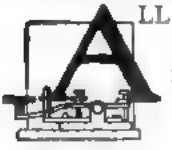
AN EASY AND QUICK MEANS OF FILLING THE COOLERS AND THUS SUPPLYING NICE COOL DRINKING WATER—BY A PIPE LINE FROM THE TENDER.

Help for Men Who Help Themselves

NUMBER 86.

THERMIT WELDING: ITS USES, ESPECIALLY IN RAILROAD PRACTISE.

BY S. MANN.



ALL you old-time machinists and engineers remember what a nice job it was to repair a broken frame on a locomotive a few years ago—how you had to dismantle it almost to the bare boiler to remove the frame

Then the frame had to be taken out to the blacksmith shop to be welded, returned to the machine-shop and put back into place. These repairs used to take considerable time and were very expensive, the railroad being very lucky if they had the locomotive in service again in a few weeks' or months' time.

Saves Time and Trouble.

There is a great departure from those old methods now. When a frame breaks in service or from other causes the roundhouse foreman either welds the frame in the roundhouse, or if the break is in an inaccessible place the locomotive is ordered to the back shop to have the wheels dropped or anything removed that would interfere with the making of a perfect weld. And it can usually be done in from twelve to twenty-four hours.

But how can it be done without removing the frame? By the use of thermit, a newly discovered substance composed of finely divided aluminum and iron oxid.

Aluminum forms the basis of the thermit process and it is therefore necessary, before describing its uses, to make a few remarks about it. Aluminum is one of the most widely distributed metals of the earth's surface.

Wherever found, aluminum is always in combination with oxygen in one form or another, and they are very hard to separate from each other, so it has been only in recent years that aluminum has been produced at a cost to make it available for commercial uses.

In the year 1827 Frederich Wohler, professor of chemistry at the University of Göttingen, succeeded in obtaining a small quantity of aluminum. But for a number of years aluminum in any quantity was unknown.

In 1854 H. St. Claire DeVille, a French chemist, succeeded in producing aluminum in a state of almost perfect purity and determined its true properties. But he could produce it only in small quantities

Another French chemist, Heroult, and an American metallurgist, Hall, by using the electric furnace for reducing the aluminum ore succeeded in producing aluminum in large quantities at a reasonable price.

Goldschmidt's Discovery.

The fact that aluminum is very hard to separate from the oxygen is used to advantage in the thermit process. As it was found possible to start a chemical reaction between the two when they are heated to a sufficiently high temperature, chemists experimented with this for a number of years in the reduction of different oxids, mixing the fine aluminum with a metallic oxid and heating the mass in a crucible until the reaction took place. This resulted in a violent reaction, so violent that it was of no commercial value.

It remained for Dr. Hans Goldschmidt, a German chemist and metallurgist, to discover that by heating the mixture at one spot instead of heating the entire mass this reaction could be controlled. This was discovered by Dr. Goldschmidt while working for the firm of Krupps, the steelmakers of Germany, in trying to produce pure metals to use as alloys with steel. He experimented with different oxids and found that the reaction produced pure alloys.

Among the different oxids was iron oxid. By mixing this with the aluminum he found that the reaction produced a very pure low carbon steel and the heat of the reaction was extremely high, approximately 5,000 degrees Fahrenheit.

Dr. Goldschmidt discovered that this intense heat could be used in many ways for welding purposes and the thermit process, now so widely known, is the result.

Two Methods of Welding.

It was used originally for the reduction of pure metal and alloys from their oxids, sulphids and chlorids by means of powdered aluminum, igniting the cold mixture. It was soon evident that this process could be applied in many other ways by utilizing the intense heat generated in the chemical reaction.

It was realized by experiments that some use could be made of this unusually high temperature, and this led to experiments in the welding of iron and steel, fusing the parts together by means of the hot thermit steel and second by using the equally hot slag for the purpose of bringing the ends of the parts together to a welding temperature and then squeezing them together to effect a butt weld.

These experiments proved successful, and it was found that the first method was applicable to the welding of heavy sections, such as broken shafts or connecting-rods, while the second was found to be applicable to the welding of pipes and small rods.

This process was introduced in the United States in 1902 and is now used by very nearly all the railroads in the United States, Canada and Mexico, being used in over 500 different railroad shops in North America. It is used for welding frames, driving-wheel spokes, cross-heads, mud-rings, eccentric straps, cylinder saddles, guide-yokes, rocker-arms, and many other broken parts.

Steel Punchings Added for Big Welds.

When making a weld with thermit one per cent of pure crushed manganese, one per cent nickel thermit, and fifteen per cent mild steel punchings are added to the amount of thermit that is required to make the weld. This is for welds requiring more than ten pounds of thermit.

Thermit being extremely difficult to ignite, a special powder is used to start the chemical reaction of the thermit. Without this powder it would be a very difficult job to start the reaction, owing to the fact that it requires the temperature of molten steel to effect ignition.

After the reaction has started it produces highly superheated liquid steel and slag. The reaction takes place in a specially designed crucible which is usually in the form of a cone. The outside of the cone is of sheet iron which is lined with a highly refractory substance called magnesia tar. Without this magnesia tar it would be almost impossible to use the thermit with any success, as the high temperature melts

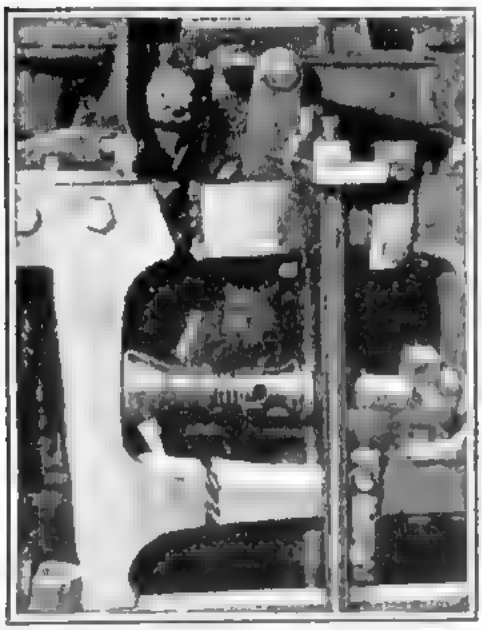
anything with which it may chance to come in contact

The first step in welding a broken frame is to remove any parts of the locomotive that may be in the way of mold-box and crucible. Then set screw-jacks to support the frame so that neither section can sag or spring out of alinement

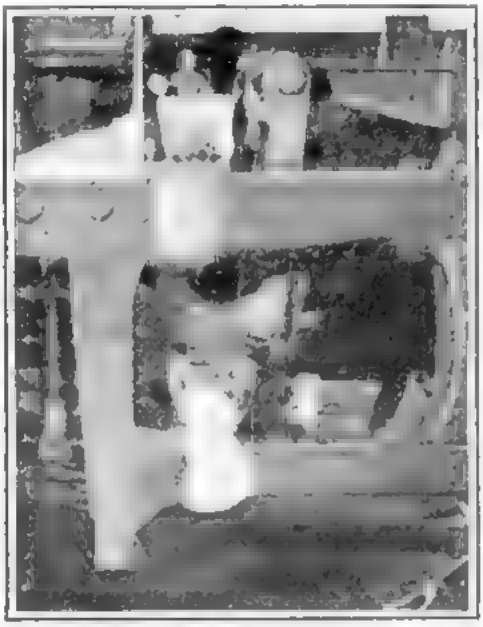
Next place tram marks on the frame so that they will come outside the mold box. The tram marks are used to show how much the frame is expanded and also after a weld to show if frame is the same as it was before putting weld on. The distance between tram marks should be known by operator and they should be put on before cutting out fracture or expanding frame with jack. Drill a line of holes along the fracture and cut out metal so that there is at least one inch opening provided; or a better way is to use the oxyacetylene cutting-flame if it is available. The one inch is provided so that the melted steel can have a free flow between the sections to be welded together.

Clean the frame thoroughly for a space of at least two to three inches from the center of fracture, so that good, bright metal is exposed, and clean off all grease and dirt as far back as the mold-box will reach, so that when the mold is rammed up and preheater put on there will be no grease to burn out and leave a space between the mold-box and the frame. If oxyacetylene is used for cutting be sure to remove all oxid and scale left on the frame from the cutting operation.

Now be sure the frame is in perfect alinement. After that the frame should be spread according to the location of the break and section.



THE FRACTURES HAVE BEEN CUT OUT AND THE JACKS INSERTED TO SPREAD THE LOCOMOTIVE FRAME IN ORDER TO ALLOW FOR CONTRACTION THE MEN ARE NOW READY TO WELD



THE WELDS HAVE BEEN MADE AND ALLOWED TO COOL. THE SURPLUS THERMIT MUST NOW BE MACHINED OFF THE PHOTOGRAPH SHOWS THE HOLES ALREADY BORED FOR THIS PURPOSE

If the fracture is between the jaws, set in screw-jacks and spread the frame one-quarter to five-sixteenths of an inch.

This is to allow for contraction, a matter which often must be left to the judgment of the operator as it depends on the width of steel collar and the amount of preheat

If jacks or other mechanical means cannot be used it will be necessary to heat the other member of the frame, if the weld is made on a double-barred frame. This can be done by the use of a crude-oil burner or by means of a basket fire of charcoal.

This should be done while the parts of the weld are being preheated. And do not remove the heat on the other member until the weld has cooled down to about the same temperature as the heated section.

The frame is now ready for the wax pattern, which is made of yellow wax. This wax should be melted and then cooled until it finally becomes fit to work with the hands.

It is then shaped around the parts to be welded in a form that is left to the judgment of the operator and the size of frame to be welded.

The mold-box is now ready to be put in place. This box should be made so as to leave at the least four inches of molding material between the wax pattern and the mold-box at all points.

After securing the box in position so that it will not move, block it so as to take the weight off the frame.

Fire-Clay and Sand for Molding-Material.

Everything is now ready for the molding-material. This should consist of one part fire-clay and two parts sharp silica sand. This material should be well mixed and then moistened enough with water to pack well.

Before starting to pack the box it would be better to set your preheating-gates and your pouring-gate. This gate should be set at the lowest part of the weld and in the center of the fracture.

The preheating gates should be set so the heat from burner will strike both sides of the frame and heat both sides equally.

But sometimes it is necessary to weld a light section to a heavier one. In that case set the preheating opening so as to favor the heavier section which will require a longer time to heat.

Now take the molding-material and place a small amount in the box. With a small stick ram and pack the material hard, keeping the material level as you pack toward the top of box. Set the preheating-gates and pouring-gate and pack the material around them hard.

It is better to use a finer mixture around the wax pattern and gates, which can be made of one part fire-clay, one part fine sand, and one part fine-ground fire-brick. Ram this around them hard so the blast from the preheating-burner will not cut the material from around these patterns.

At the highest point of the wax pattern set the riser pattern. If there is more than one, set a riser pattern over each.

The purpose of the riser is to hold a surplus of thermit steel which will remain liquid for a considerable time and take care of all shrinkage so that when a "pipe" is formed due to shrinkage it will form in the riser and not in the weld. The riser also acts as a depository of loose sand and other foreign matter which is washed in by the flow of thermit steel.

If the weld is in such a place that you cannot withdraw the riser, use a piece of pipe and leave it in the mold. After packing the mold hollow out the top so as to form a basin to collect the slag and surplus thermit steel so it will not overrun the mold-box.

Then vent the mold thoroughly by punching holes with a rod or heavy wire, so that all gases in the liquid steel will have a chance to escape. If this is not done the finished weld will be full of holes caused by the gas and will weaken the weld considerably.

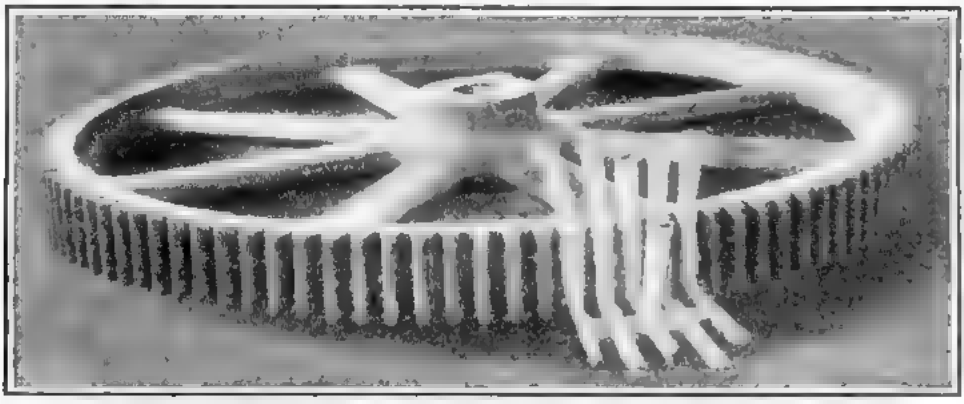
Careful with the Openings.

Now tap the gate, riser and heating openings, drawing them out carefully. Then cover the openings so that nothing will fall in them.

Now is the time to adjust the crucible in position. This should be hung about three inches above and directly over the center of pouring-gate. When this cannot be done construct a trough and run the liquid steel into the pouring-gate of the mold.

The mold is now ready to preheat. Set the burner of the preheater about one inch from the preheating gate in direct line with the opening. Then start burner going and turn it on very easily at first, as too much of a blast would cut the mold.

Sometimes it is difficult to start the burner when it is cold. In that case put end of burner in the opening and start



FIVE BROKEN TEETH IN THIS BIG GEAR-WHEEL WERE REPLACED BY THERMIT, MAKING THE CASTING ALMOST AS GOOD AS NEW

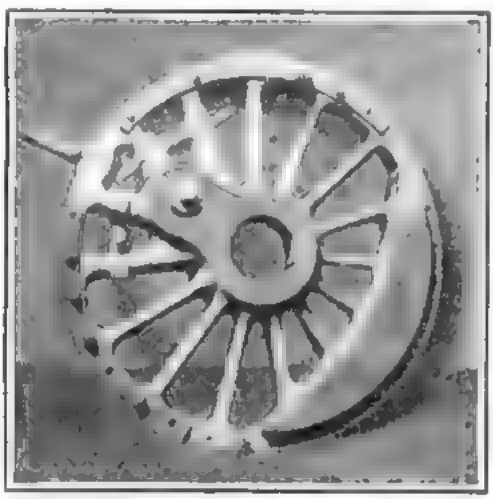
blast. The flames will issue back and heat burner, then when it is going well it can be returned to former position.

The wax will burn out and leave a perfect mold the shape of the wax pattern. Keep the heat on until the parts to be welded are brought up to a good workable heat such as would be required if the frame were to be hammered. This means very near a white heat

While the weld is being preheated the crucible should be plugged and the thermit with its additions should be put in. In plugging the crucible great care should be used to have the plugging material firmly in place

There will be no danger then of the thermit steel running out prematurely.

The tapping-pan is suspended by its head inside the "thimble" and allowed to project about two inches below bottom of crucible. Then put the asbestos washers over top of pin and a metal disk on top of them, ram them thoroughly in place and cover with refractory sand.



WHERE FOUR SPOKES WERE REPAIRED ON A DRIVING WHEEL, SAVING IT FROM THE SCRAP-HEAP

The thermit, with the additions, can now be put in. Mix the thermit charge thoroughly before putting in the crucible.

Drop a few handfuls in first before dumping the rest of the thermit in and then the plugging material will not be disturbed. Do not add any ignition powder until you are ready to start the reaction.

When the flame is at a good workable heat remove the preheater and direct it down the riser; this will blow out any sand or dirt which may be in the mold. If the riser is hard to get at direct flame down pouring-gate.

Then plug the preheating hole with a dry sand core, iron plug, or anything that will keep the thermit steel from running out through the preheating-hole

Ignite with Match or Iron.

Now place a small amount of ignition powder on top of the thermit in crucible and ignite this with a parlor match, applying match immediately after striking, or ignite with red-hot iron. This is often the easiest but not always the quickest way.

After the reaction has started wait at least thirty-five seconds before tapping the

crucible. This gives the steel punchings time to melt and also gives the steel and slag a good chance to separate.

Now tap the crucible by pushing up the tapping-pin, using a flat piece of iron or a regular tapping-spade.

Hold up expansion on frame with jack, crude-oil burner or brick furnace, until the metal in weld has set and shrinkage sets in; then remove jack or shut off heat. This usually can be done two or three hours after the weld is made.

The mold-box should be allowed to remain as long as possible and in no case should it be removed until at least six hours after weld is made. After removing the mold-box drill off metal left in risers and pouring-gate.

If everything has worked successfully the frame should be stronger than it was originally and should last indefinitely as the frame will seldom break in the same place if the operator has done everything correctly.

How to Calculate Amounts.

Now there are several things in regard to welding a frame that have not been mentioned. When the quantity of unmixed thermit is calculated for welding the frame it is best not to guess how much will be required to weld the frame.

One way is to calculate from the quantity of wax used, great care being taken to have the space filled with wax that is to be welded. Then by weighing the wax before and after the completion of the operation the difference will be the quantity of wax used, and this weight in pounds multiplied by twenty-five will give the amount of unmixed thermit required for welds using up to one hundred and fifty pounds of thermit.

To this add the thermit additions that are required. Where railroad thermit is used allow twenty-nine and three-quarter pounds of this thermit to a pound of wax. Railroad thermit is all ready mixed with one per cent manganese, one per cent nickel thermit and fifteen per cent steel punchings.

When calculating in advance the amount of thermit required it is first necessary to estimate the number of cubic inches in the space that is to be welded—that is, the cubical contents of collar and space between the ends to be welded. After the cubical contents is found allow one pound of railroad thermit to a cubic inch.

Setting the Pouring-Gate.

In setting the pouring-gate it is a very good idea to put a flat fire-brick at the top opening of gate. This is so the thermit steel will strike the brick instead of the molding-material as it runs from crucible into the mold.

By doing this there will be no chance for the thermit steel to eat its way through the molding-material and loose the weld.

When plugging up preheating-holes see that the dry sand core is firmly in place and backed on outside of mold-box with a shovelful of sand or a quantity of fire-clay mixed up so it is about the same consistency as putty. This can be held in place by a board or wedges.

This will prevent any possibility of the thermit steel running out through preheating-opening.

In selecting the steel punchings don't have them over three-eighths inch by one-quarter inch if possible. If punchings are not handy use rivets one-quarter inch by three-quarters inch or one inch and have them clean before mixing with thermit. Don't use any turnings from a wheel lathe in place of punchings; they have a tendency to make the weld hard.

If there isn't any wax to use in making pattern, don't use pin-grease or wood. Pin-grease has sulfur in it and sulfur is very undesirable in iron or steel. Pin-grease and wood when they burn out leave a carbon deposit on the frame. This is undesirable, as the frame should be perfectly clean.

In preheating use gasoline or kerosene; this will give a cleaner frame than crude oil. If crude oil is used when the burner is first started carbon is deposited on the frame and a dirty frame is the result.

It is advisable to suspend the crucible before starting to preheat and have it charged. Everything will be ready for pouring at the proper time. After the wax

is melted out small pieces of sheet-iron should be packed over riser openings and pouring-gate to hold the heat in.

If one part heats more rapidly than another the heat can be regulated by means of these plates or by shifting the burner up, down, in, out, and sidewise.

When Frame Breaks in Inaccessible Places.

Sometimes the frame breaks in inaccessible places, such as the top frame under the fire-box or top of pedestal jaws in the same place. This is a difficult place to get at and generally the flares, ash-pans, and grates have to come down. That is the best way; the crucible can be set up inside the fire-box.

If that is impossible the best way is to build a trough and set the crucible outside the fire-box and connect the mold-box with the trough, giving the trough sufficient slant so the thermit steel will flow freely. This trough should be six inches by four inches, the length being left to the judgment of the operator.

This trough should be lined with the molding-material used in packing the mold-box and should be thoroughly baked before using. The best way though is to line the trough with magnesia tar.

By using the trough the broken parts can be welded successfully when there would be no chance of putting the crucible directly over the pouring-gate.

Now this covers frame-welding very thoroughly, but doesn't cover all the uses of thermit around the railroad shops. The other broken parts that can be welded on a locomotive have been mentioned previously.

These can generally be welded in the same manner as a frame-break. But several require a little different procedure in preparing for the weld.

In welding a broken mud-ring it will be necessary to cut a piece out of the throat-sheet of fire-box and a corresponding piece out of the flue-sheet large enough to permit surrounding weld with mold-box. The other steps of the welding operation are performed as in welding a frame.

In making repairs to the spokes of locomotive drivers the operation is the same. Of course the tire should be removed.

Contraction is taken care of by heating the adjacent spokes. This will take care of any unequal strains due to preheating.

It is advisable to insert a clamp between segments of rim to hold same in alinement during welding. Sometimes if the spoke has a piece broken out completely it is possible to cast in a piece of thermit steel to replace that broken out, but if the piece broken out is over six inches long it is better to insert a piece of steel of proper length and weld the same to spoke, welding one end of piece to spoke separately and then when that is cooled off welding the other end.

This covers thermit welding in the railroad shops very thoroughly and anybody should be able to understand its uses and make a successful weld by following directions accurately, though practical experience is the best teacher of all.

Thermit was found to be so successful in welding broken frames and other broken parts of a locomotive that the question was asked:

"Why couldn't it be used in welding other broken parts?"

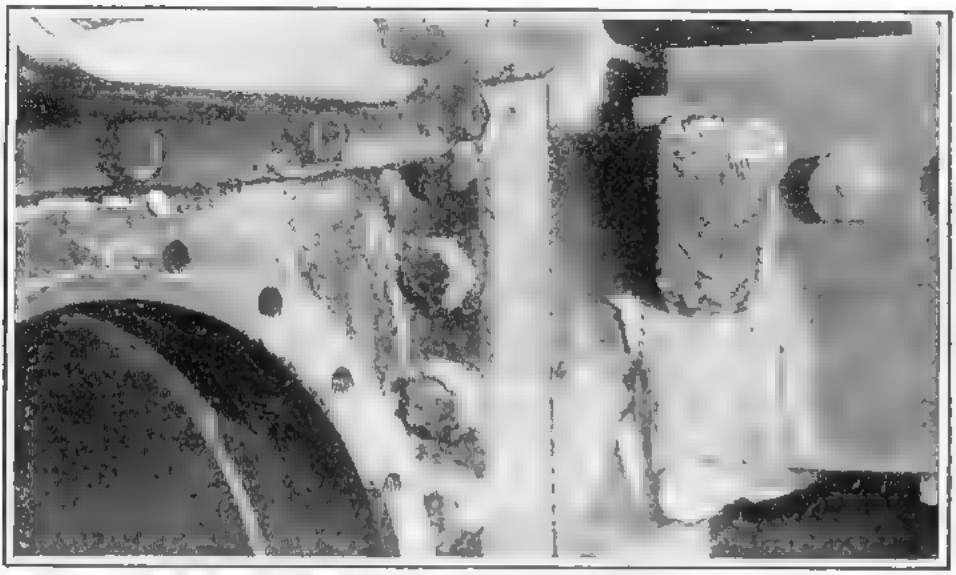
This question has been answered by the enormous quantity of thermit that is used outside the railroad shops.

Street Railways Find It Handy.

One of the greatest fields of usefulness for the thermit process is found in welding rails for street railways. The apparatus is simple in operation and a few joints can be welded almost as cheaply as a large number.

The street-railway companies are realizing more and more the importance of installing permanent joints in place of mechanical joints, and welding is the only means to attain that end. The weld not only prolongs the life of the rail, but is also a great saver on the rolling-stock, a smooth road being a great deal better for the wear and tear on the rolling-stock than a rough road-bed, and a rough road-bed will never be eliminated as long as mechanical joints are in use.

These can be taken care of out in the



ONLY WITH THERMIT COULD THIS DIFFICULT WELD HAVE BEEN MADE. IT WAS DONE IN A CORNER OF THE LOCOMOTIVE, CLOSE TO THE CYLINDER.

country, but in the cities, with their paved streets, it is impossible to do this without tearing up the pavement. This is very seldom done, and a broken rail is often the result.

This makes it necessary to replace the

WELDING RAILS BY THE THERMIT PROCESS ELIMINATES MECHANICAL JOINTS. THE RAIL ENDS ARE HEATED INSIDE THE MOLDS, PREVIOUS TO POURING IN THE THERMIT STEEL TO MAKE THE WELD.

rail and the cost of operation will exceed many times the cost of a weld.

Furthermore the weld also reduces the resistance in the return electric circuit, effecting a saving of power. It also tends to reduce damage by electrolysis to water-pipes, the current staying in the rails when they are properly bonded instead of jumping to near-by water-pipes.

In making a rail weld the thermit steel is fused around the base of the flange and also around the sides of the head. A piece of insert steel is placed between the two rail-ends and this and the rail-ends are then preheated to a welding temperature.

The thermit steel is then run into the mold, the heat of the liquid steel melting and fusing the bottom of insert steel and rail ends, and the heat of the steel and slag for butt welding the insert in the heads of the rails, the result being that the entire rail section is welded into a solid piece.

After the joint has been welded it is ground to a proper form by means of a special rail-grinder perfected for that purpose.

Thermit is also used to weld motor cases and truck frames.

Another very useful application of thermit is pipe-welding. It is used for joining wrought-iron or steel pipes together by means of butt-welding; the same being used in welding tubes for steam pressure, deep-well lining, hydraulic work, compressed air, and particularly in refrigerating-plants where ammonia pipe-lines are used and where a permanent non-leakable joint is wanted.

This eliminates all joints and gives one continuous pipe-line, and the welded joints can usually be installed cheaper than the regular ammonia flanged connections.

Pipe-Ends Must Be Squared Accurately.

In pipe-welding the pipe-ends have to be accurately squared up by a special machine and held tightly together by means of clamps. A cast-iron mold is then placed around the pipe-ends and a proper amount of thermit ignited in a small flat-bottomed crucible or ladle and poured into the mold.

The slag which floats on top goes into the mold first and covers the inside of mold and outside of pipe with a protective covering which prevents the liquid steel following from coming in contact with either, the heat of slag and liquid steel bringing the pipe-ends to a welding temperature, at which time they are squeezed together making a butt-weld.

The entire mass of thermit can then be knocked away from pipe, and the only resulting effect will be a slight upset at the joint. As no outside power is required the welds can be made anywhere.

Much Used in Marine Repairs.

Thermit is used extensively in marine repairs, welding broken stern-posts, rudder-frames, and propeller-struts of steamships, and other broken parts, such repairs seldom keeping the ship in drydock more than forty-eight hours.

The United States Navy has seen the advantages of the process and has completely equipped the repair ships Panther, Dixie, and Vestal with thermit welding-outfits, doing very important work with them.

The United States government used vast quantities of thermit in building the Panama Canal, using it to reclaim broken parts of dredges, dipper-buckets, locomotives, rock-crushers, rock-drills, air-compressors and other broken parts too numerous to mention.

Now that the canal is completed the process will be retained and will be used in the permanent repair-shops for maintaining the equipment used in operating the canal and for making repairs on vessels passing through and using the dry docks provided for that purpose.

In the way of general repairs a great many broken crank-shafts have been repaired, particularly shafts used in refrigerating machines. These shafts have to be alined very accurately before making the welds, and the best way to do this is to use V blocks and a machined bed plate.

By using this method the shaft can be alined very accurately. The fracture is then cut out and the weld made in the usual way.

In a few cases it is necessary to cut out the entire bearing and weld a piece of steel

SECTION CUT THROUGH A THERMIT WELD ON THE PIN JOURNAL OF A 9-INCH CRANK SHAFT, SHOWING THE PERFECT AMALGAMATION OF THE THERMIT STEEL WITH THAT OF THE SHAFT.

to replace it, using a thermit weld on each end. The shaft can then be placed in a lathe and the bearing turned down to proper size.

The shaft will usually be found to be stronger and better than originally, the flaw having been located and eliminated the rest of the shaft having been thoroughly tested before.

A few years ago one of the big thermit companies got a "wire" from the Clyde Steamship Line that one of its vessels, the S.S. Iroquois, was coming into port that night with a broken connecting-rod, and that the ship was scheduled to sail again in two days.

Quick action was imperative! Without a minute's waste, a huge truck was fitted up and rushed to the docks. It was the night before Christmas. When the Iroquois had docked all hands got busy, and at ten o'clock the enormous shaft was loaded on to the truck and speeding away toward the company's factory.

All night long welders worked on the rod, and all Christmas Day. During that night it was allowed to cool, and the next morning it was taken on board ship and set in place. The S.S. Iroquois sailed at three-thirty o'clock that afternoon—on schedule time.

A loss of thousands of dollars which would have resulted from a long delay had been averted by the thermit welding process. This is regarded as one of the most sensational jobs in the history of the industry.

A type of repair of particular interest is the welding of large rolls and pinions in steel plants. Usually it is necessary to cast on entire new ends.

This is done by placing the roll or pinion vertically in a pit and constructing a mold around the fractured end. This end is then heated to a welding temperature and is then covered with thermit steel to a depth of one inch in order to bring it up to a fusing temperature.

Pour 6,000 Pounds of Liquid Steel.

Liquid steel from a ladle is then poured into the mold, about six thousand pounds being allowed to run through and overflow. The overflow gate is then plugged

THE CRUCIBLE FOR THERMIT WELDING IS MADE OF SHEET IRON, AND IS LINED WITH A HIGHLY REFRACTORY SUBSTANCE CALLED MAGNESIA TAR WHICH IS ESSENTIAL TO THE PROCESS.

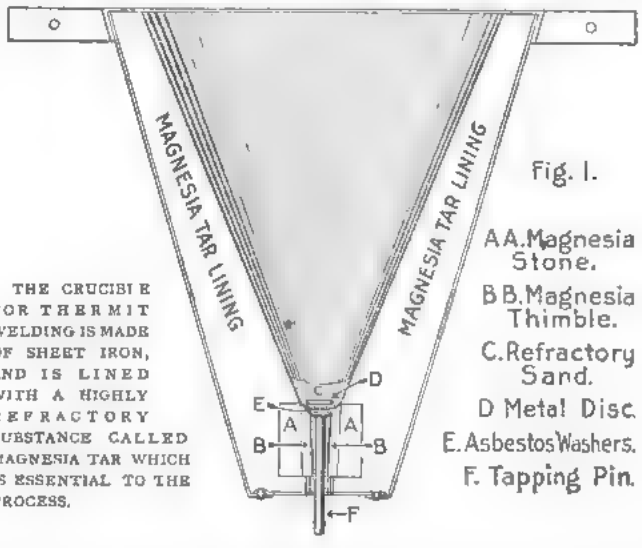


Fig. I.

AA. Magnesia Stone.
BB. Magnesia Thimble.
C. Refractory Sand.
D Metal Disc.
E. Asbestos Washers.
F. Tapping Pin.

up and the mold is thereupon filled clear to the top.

When the mold cools it will be found that the metal is welded perfectly to the steel of roll or pinion. The metal passing through the overflow gate is caught in ingot molds and is used in the regular way. Rolls and pinions weighing up to seventeen tons are often repaired in this way.

It is also used in repairing broken shears, driving-shafts, teeth in large pinions, large cross-heads and numerous other large parts where the expense would be considerable to replace them.

In addition to the many different applications of the process which have been described it is used very extensively in foundries and steel works for reviving dull iron in the ladle, keeping risers of casting liquid, preventing piping in ingots and is also used very extensively for making mine repairs.

This covers all the present uses of the thermit process. But the process is now in its infancy. In all probability many more applications will be discovered for this wonderful energy so mysteriously and quickly created.

WHEN THE MOGULS GO TO SLEEP.

BY REMSEN CRAWFORD.

THERE'S a solace in the forest when the giant oaks are sleeping,
All enraptured by the cricket's lullaby;
There is balm upon a battle-field when sentinels are creeping
In their vigils where the lead has ceased to fly.

But there's comfort more enthralling where the locomotive's steaming
In the dimly lighted yards in dead of night,
For the murmur of the moguls, as they softly go to dreaming,
Means they left the world a smiling in their flight.

When a tyrant, worn with battle, falls into a heavy slumber,
Humankind is chilled with awe lest he awake,
For his task and his ambition all mean murders without number,
And his trophies, precious women's hearts that ache.

But when moguls go to dreaming, oh, so travel-worn and weary
From their toil along a path of hardened steel,
Seems the twinkling stars above them beam a blessing bright and cheery,
And the prayers of all the world are for their weal.

When the morning sun is beaming they'll awaken from their dreaming,
And the yards with their endeavors will resound;
And they'll clamor on the sidings with their cylinders all steaming,
In a rivalry to be first outward bound.

Heaven see that naught delay them! Hungry denizens await them,
For they're dragging precious cargoes just behind.
May their journey be a safe one, and may nothing e'er belate them,
Oh, the mogul is the friend of humankind!

WHAT I, THE HEADLIGHT, SEE.

There Are Many Queer Happenings along the Right-of-Way at Night, Friends, and Not One Escapes Me.

BY WILLIAM FRANCIS.

I AM the mighty Headlight of a locomotive. I see some queer things, some of which are as follows:

Automobile drivers going over crossings with heads turned back, talking to some one, while I rush at them.

Lovers strolling along the right-of-way, billing and cooing and saying nothing. I glare at them, and they turn the other way; but, bless them, they needn't be ashamed—all the world loves a lover.

Pedestrians who have no business on the tracks, and who are better known as trespassers. For them I have only contempt; still, when I see them I flash a warning to the engineer, the whistle is blown, and on I go to a bridge from which a man slowly steps to the gravel beside the ties as I look across the shiny rails to the embankment opposite.

There's but a moment between us, yet the man light-heartedly waves a salute, and I plunge on to new scenes, wondering why mankind loves to take chances.

Then I come near a country road-crossing just in time to see a farmer whipping his horses in an effort to beat me to it. I give the signal of light, and there's a scream of the whistle that ought to curdle the blood in a man of stone, if he has any, but I see Mr. Farmer increase the blows from one in four seconds to one in two seconds.

He is now on the track, and the engineer applies the air, coasts, and gives something better than a blast of his whistle—it sounds like a death-knell, the song of a siren or the dying note of a lost soul.

The wagon stops, we approach; the team starts again—it crosses the track—we miss it by three feet, and I hear my religious, church-going, home-loving engineer, my friend who wipes my face when it's dirty, and who treats me as his very own, say things unfit to print.

On we go: presently away off in the distance, almost to the end of my vision—perhaps five hundred yards away on a straight track—I see a small object. Yes, it moves. We are making fifty-nine miles an hour, and in less time than it takes to tell it I discover it is just a poor cur dog.

We are nine minutes late.

The dog turns, sees me, and increases his pace on down the middle of the track.

Why doesn't he get off?

I don't know.

Will my face be splashed with his blood?

No, sir!

I feel a slight slackening, hear two or three light toots of the whistle, and the doggie takes another look at me. He's a good runner, and now he puts on speed. Does he know we've slowed down, the confounded fool brute? He's still in the middle of the track. Somebody's pet, but a blooming idiot. He can run like a racehorse; he knows it, and is showing off. I feel another kind of a pulsation of the big machine under me; then a screech and a lot of small screeches as if my engineer were coaxing the dog to get off the track. We are going faster and faster. The dog is going to be killed—he is but ten yards ahead of us.

And then he decides not to be killed, jumps to the right, and—what do you think? He actually wags his tail. Of course, I saw but one wag, we were going

so fast. And then I heard the engineer say, "I don't want to kill even a dog; but if he hadn't changed his mind and quit his fooling I'd have scattered his carcass in souvenirs from here to Calico Bend."

Yes, I see some funny things, both winter and summer. When the bugs and mosquitos are on the wing and I am being projected through space at top speed I'm sometimes nearly blinded, but I keep a light-hole burrowed through the darkness; and in the winter when the blizzards sweep across my path my face shines, if not so far away, and perhaps dimly, yet it shines, for I cannot turn my head. There may be some wanderer on the track or a reckless fool on a crossing, and I must keep my faithful men in the cab—the engineer and the fireman—as clearly guided as possible.

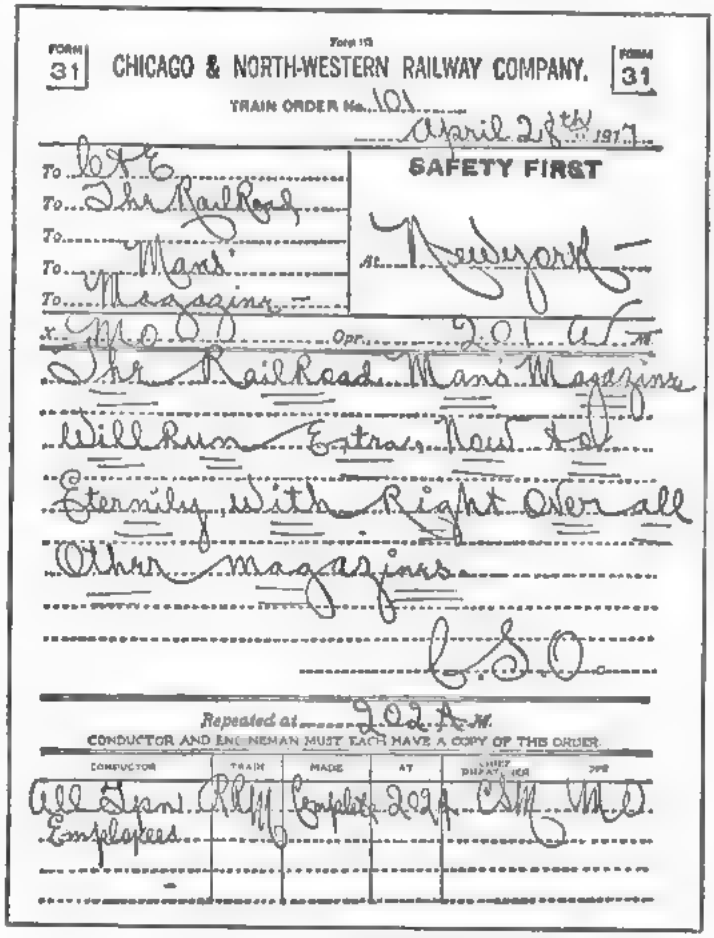
I am the headlight of a locomotive, often seen, frequently ignored; but I am of some importance, friends, let me tell you that.

FLIP THIS FLIMSY OVER, YE OPRS!

WHEN one of our telegraphic reader-friends finished perusing a recent issue of the RAILROAD MAN'S MAGAZINE he became so enthusiastic that he sat down immediately, pulled out his despatch-pad and forthwith wrote out an order to us to "run extra, now to eternity, with right over all other magazines."

It made us feel good all over to get this warm expression of appreciation from one of the boys. And it helps convince us of what we have been noticing for some time now — that the RAILROAD MAN'S MAGAZINE has won a lasting place in the hearts of the brass-pounders of the country as well as in those of their railroad brothers.

Incidentally we would like to know whether our friend, C. S. O., took part in the Opr's Fist Contest, which has created such a sensation among telegraphers the whole country over. And if not, why not? For, judging from this specimen, he has a mighty good fist—one that is both clear and fast—meritorious in every way.



Form 19

FORM 31 CHICAGO & NORTH-WESTERN RAILWAY COMPANY. FORM 31

TRAIN ORDER No. 101

April 24th 1917

SAFETY FIRST

To C. S. O.
To The Rail Road
To
To Mans'
To Magazine

At New York

x M. O. O. Opr. 2.01 A. M.

The Rail Road Mans Magazine
Will Run Extras Next to
Eternity, With Right Over all
Other magazines
C. S. O.

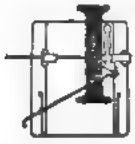
Repeated at 2.02 A. M.

CONDUCTOR AND ENGINEMAN MUST EACH HAVE A COPY OF THIS ORDER.

CONDUCTOR	TRAIN	MADE	AT	CHIEF DISPATCHER	OPR
All Spare Employees	R.R.M.	Complete	2.02 A. M.	C.S.M.	M.O.

HERE'S A TRAIN ORDER ONE ENTHUSIASTIC READER OF THE MAGAZINE SENT IN.

FAIR RAILROADERS, WHOSE JOB IS—



INTELLIGENT travel. Comfortable travel. Worth-while travel. Those are the slogans which two big Western railroads are spreading through a brand new sort of medium—women passenger agents.

Miss Orpha J. Moss, of Chicago, and Miss Avis Lobdell are two women who occupy these unique jobs. Both are making good with a bang!

MISS AVIS LOBDELL

SHE TRAVELS ABOUT THE COUNTRY TEACHING PEOPLE HOW TO AVOID MISTAKES IN TRAVELING

Miss Moss is a Park Expert.

Miss Moss, who is officially known as Traveling Passenger Agent for the Union Pacific (and also for the Chicago and Northwestern) divides her time between wandering around in our national parks and initiating tourists to their wonderful beauty —a perpetual vacation.

Of course, Miss Moss doesn't spend all her time seeing the wonders of the Yellowstone, Estes and other parks. She has already seen them so often that she can find her way about them in the dark.

When she does go, it is as escort to other travelers, and those who submit themselves to her guidance are certain of seeing the most interesting things everywhere they go, and at a minimum of effort and money. In other words, Miss Moss has the Seeing America First idea down to a science.

You are a prospective traveler. You go to the tours department of the Northwestern to find out about a vacation trip to one of the parks.

Miss Moss is called into consultation. When you have told her where you want to go, how long you wish to stay, and the route you prefer, your part of the conference is finished.

It doesn't take Miss Moss more than a few minutes to show you every detail of the proposed trip, including side journeys, railroad and hotel accommodations, and so on.

There isn't a chance in the world that anything will go wrong, or that you will miss any of the interesting sights offered by the regions you expect to visit. And that is a most important consideration, for some of the most picturesque of the mountain scenery lies in the great reservations and ranges removed from the railroad, and can only be reached by highway and trail. Miss Moss knows all the nooks and corners, and she plans to have you see just what she has seen—with the minimum discomfort.

—TO MAKE TRAVELING EASY FOR YOU.

The cost of the whole thing, covering transportation, sleeping-car berths and meals, hotel accommodations, *et cetera*, is worked out to the last penny. This is a great advantage, as will be appreciated by those who have worked out their own schedules and found at the end of their journey that they had spent about twice as much as they had figured on.

Previous to taking up her present work, Miss Moss was engaged in the advertising business. But she always took a long vacation each summer, visiting the various resorts of the country. In this way she acquired a vast fund of information on the subject, so that when the Northwestern decided to add a woman to its staff of travel specialists, she was immediately invited to take the position.

Lecturess Lobdell.

Miss Lobdell, who is a passenger agent for the Oregon-Washington Railroad and Navigation Company, carries on her work mainly through lectures and consultations.

A speaker of great charm and force, she is welcomed everywhere by colleges, clubs, parent-teacher organizations and other groups. "Intelligent Travel" is her chief lecture topic, and she has done much to make traveling easier for people.

Among other things, she gives practical demonstrations of how to read a railroad ticket, how to decipher time-tables, and how to use the two together.

She tells her audiences also about the correct and incorrect sources of information and the protection which the railroad affords its patrons. Miss Lobdell was a newspaper woman before she entered the railroad service

In addition to doing the usual work of a passenger-agent, Miss Lobdell has the particular work of looking after the welfare of women passengers.

How thoroughly versed in the subject of railroad travel she is may be judged by the fact that a few months ago, she went to the University of Oregon, by special invitation, to deliver a series of lectures before the faculty, student body, and other groups.

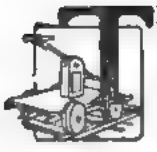
MISS ORPHA J. MOSS,

WHO HELPS HUNDREDS EVERY YEAR PLAN A HAPPY VACATION IN OUR NATIONAL PARKS.

PRANKS OF WELL-KNOWN OPERATORS.

The Quick Wit Needed at the Key Isn't Allowed to Slow Up When Off the Job, as These Anecdotes Show.

BY JESSE K. BROWN.



THE telegraph business has produced many colorful personalities, and many operators that have won world recognition in other lines of endeavor. It suffices to mention only two—Jay Gould and Thomas Edison.

Many tales of the telegraph have been written, some of them serious, but the majority in a humorous vein. Some of these stories have been written by men who knew their subjects, but invented their characters. Others have been absolute rot by authors who faked.

The little anecdotes of this article are of real operators, by an operator who knew all of them, and at least have the value of truth.

Johnny Partridge, who went out of service some years back, was dark and slim and handsome. He was a fine operator and a favorite with ladies, but he loved a joke so well he was prone to perpetrate one and count the cost afterward.

At the height of the football season one year Johnny was the prize hurler on the coast wire at Denver for a big press association. When the line-up of the Carlisle Indian team came along, Johnny substituted the names of operators on his circuit for "Rain-in-the-Face," "Polar Bear," etc. His list ran like this:

Right end	McDONALD (IKE)
Right tackle	DUGAN (JOHNNY)
Right guard	EITERMAN (SPIDER)
Center	McINERNEY (BEN)
Left end	GEISTLICH (BOB), etc.

One paper kicked, and Partridge was given two weeks on the ground.

One of the most genial of good fellows, one of the best story-tellers, and a crackerjack operator was the late Bill Mitchell. He was always happy, even when his personal irresponsibility was disastrous to himself.

Bill did a lot of traveling, frequently as a guest of the conductor. On one occasion, when his persuasiveness failed, he stowed away in the ice-box at the top of a refrigerator-car.

When the car reached Truckee, in the Sierra Nevada Mountains, Bill had enough, and tried to crawl out. But he was a 220-pounder, and yank and pull as hard as he could, his low-hanging chest stuck in the iron grating.

Finally, Bill called loudly for help, and a husky lineman came to his aid. He seized Bill by the arms, and hauled and pulled, while Bill kicked and puffed, but Bill's mid-section could not be squeezed past the bars.

At last the accommodating lineman descended into the box, hoisted Bill on his shoulders, and shoved him through the grating. But now there was a new complication. The lineman was even larger than Bill, and he in turn was trapped. A call on the master mechanic's office, however, saved him from being frappéd.

In the days before San Francisco's big fire there was a bunch of practical jokers who had every one stepping lively. One of these fellows was Tom Dunnigan, now in

charge of the Western Union's messenger force in the Bay City. This is one of the things Tom used to do to initiates:

A wooden box eighteen inches square and deep would be filled with sawdust, and in its center would be placed one lonely ink-well. A green boy would be started with this box from the Montgomery Street main office to "D" office, on Market Street.

An operator would tell D office what was coming, and that office would send him to "3" office. The boy would thus be shunted from office to office until his arms gave out, or intelligence was born.

Many veterans of the telegraph, if asked whom they consider the best operator, will reply unhesitatingly:

"Kid Campbell was the finest the world ever saw, or ever will see."

Walter Campbell, who received his final "30" in St. Louis a few years ago, excelled in all branches of telegraphy—railroading, commercial, brokerage, and press. He had held responsible positions in the editorial departments of the Associated Press and the International News Service. When big stories were running, it was common of him to send thousands of words while listening to the receiving sounder.

Campbell was a fine-looking man, of quick intelligence and broad observation. A distinguishing trait was his modesty, which possibly explains the absence of his name from record-lists, for he never took part in a tournament. Neither could he be induced to talk of his ability, although no operator was too mediocre to receive praise from Campbell.

An uncontrollable nervousness, an inability to sleep, account in part for his propensity to sudden and unexpected travel. He disappeared from New York City, where he held a fine desk-job, and was heard of next in a Kansas railroad station. Thousand-mile jumps were frequent with him.

One morning at five o'clock, in Salt Lake City, he finished work a few minutes ahead of Dick Cogan, who was copying the old United Press report across the street, on the second floor of the Herald building. Crossing the street to see Cogan, Campbell picked up a discarded cantaloup, flung it through Cogan's open window, splashing it on his typewriter.

That night Cogan received a telegram from Campbell, dated Reno, Nevada, which read:

> Am on my way to Frisco. Give my love to Mrs. Campbell. How is she?

After a conference with Mrs. Campbell, Cogan replied:

> Mrs. Campbell feeling fine, and sends her love. Hopes you will enjoy S. F. We are going to see De Wolf Hopper in El Capitan to-night.

Back came the message:

> Home to-morrow.

From about 1902 to 1912, Bob Geistlich, one of the most popular of telegraphers living, was chief operator of the western division of the Associated Press, with headquarters in San Francisco. During those ten years he ticked off from his own observation the description by rounds of nearly all the championship and other important prize-fights in the western part of the United States. Often he sent the "leads" and feature stories as well, for he was a whole team.

Among the battles covered by Bob were the Jeffries-Corbett in San Francisco, the Jeffries-Johnson at Reno, the Nelson-Gans at Goldfield and in San Francisco, the Flynn-Morris at Albuquerque, the Wolgast-Nelson at Richmond, California; the Britt-Gans and Wolcott-Gans in San Francisco, and scores of others.

Geistlich would rather forego a dearly beloved good dinner than miss a chance for a joke. Once he rushed into a Western Union branch-office, and dashed off this message on a blank:

> Send carload style ⊕ bicycles with ⊥ cranks and ⊡ bearings.

The young girl operator was flabbergasted.

"We can't send that, sir," she said. "There are no such signs in the Morse."

Apparently disgusted, Bob picked up the message.

"All right," he snapped, "it goes Postal. I've sent hundreds that way."

"I'll take it," said the flustered girl. "If the Postal can handle it, we can."

But Bob, seemingly incensed, rushed out with his "message."

Later, when chief operator of the Associated Press, an operator applied to Geistlich for a job. The man was undesirable, but Bob, wishing to let him down easy, said he had nothing then, but might have when the Associated Press opened an office on the Farallone Islands.

These islands lie twenty-four miles off the Golden Gate, and are inhabited only by about twenty lighthouse people. As the press associations do not ordinarily have leased wires in towns of less than fifteen thousand population, Geistlich thought his joke was understood. But in one month the operator was back inquiring after the Farallone job.

Peter Christensen, a youngster from San Francisco, was given a night job on the California Northwestern Railroad. He went duck-hunting one day, and was aroused late at night by the furious calling of the train-despatcher.

In the distance Christensen heard a rumbling sound.

He grabbed the key and reported No. 21 by, but an instant later the operator at Petaluma "OS'd" the train, and the despatcher snapped at Christensen:

"You poor simp, 21 isn't due at your station for thirty minutes."

Christensen had "OS'd" a lumber wagon.

Allan T. Baum, now president of the Pacific Coast Baseball League, was for several years a good press operator before he became sporting editor of the San Francisco *Examiner*.

Al liked to play when off duty, although very much on the job in working-hours. One night, on returning from the Sutro Baths with two sisters, he festooned the girls' wet stockings on a lamp-post in front of their home. After he had departed, whistling happily, the girls had to shin up the post to remove its drapery.

About that time automobiles were an expensive novelty. One night Baum and his party hired one in front of the Waldorf Café, drove across Market Street to the Palace Hotel, stayed six hours, reentered the car, recrossed Market Street, and paid the driver $30.

One of the most picturesque characters among telegraphers is D. E. Bohannon. When he works at his craft, it is because nothing else is available. A few of the things "Bo" has done are to win $30,000 at the Emeryville race-track, tote it home tied up in his coat, and establish a socialist newspaper; promote a wave-power company, and deliver lectures.

One night, Bohannon, attired in a long, black frock-coat and high silk hat, was haranguing a street crowd from a wagon, when some one slapped the horse with a board.

Just as he sat kaplunk on the pavement, Bohannon exclaimed.

"I'll bet some operator did that."

Happy in his job, a friend to every one, an easy prey for a "touch," devoted to his family, and an irrepressible joker, fairly describes big Ben McInerney, long-time star operator with the old United Press, the Associated Press, and now with the International News Service in San Francisco. Although six feet two, Ben has never grown up. To tell of the jokes he has played would require a book.

The man who matches wits with the big Irishman must have a nimble mind. An editor who had annoyed Ben by incessant chattering thought to "kid" him.

"What will you do when I am gone, Ben?" he asked.

"By golly, I don't know, Willie," said Ben, "unless we get a parrot."

One night Ben had a long story to send East. A visitor was in the office, Ben was talking, and the story moved by jerks. The man at Denver, responsible for the circuit, sulked and said nothing until Ben was through sending. Then Denver threatened indignantly:

"You've laid me out fifteen minutes, and I'm going to turn you in."

It lacked an hour and one-half till lunch-time, and the fellow at Denver flashed the sheets in five minutes to a sheet. But Ben back-timed them all, and, allowing six or seven minutes to some sheets, accounted for the fifteen minutes lost.

The Denver man made his report, it was sent on to San Francisco, the sheets were dug up, and the man in charge, without even referring the complaint to Ben, characterized it to Denver as the finest attempt to "pass the buck" he had ever seen.

In his "off" hours he spends much time along the wharves, for he never tires of looking at shipping, or talking to battered sailors and 'longshoremen. As the Mare Island boat left its pier one afternoon, Ben rushed along the wharf and exclaimed to a lonely Chinaman·

"You see that boat? I'm the captain, and the mate has gone off without me. I'll fix him. You good cook? Yes. Well, you be here at four o'clock, when she comes back, and I'll give you job."

Then, to compensate the Chinaman, he gave him tow bits "in advance" to make it up to the trustful Oriental for having a half-day's work.

The night operator for the Associated Press at Sacramento at that time was Harry Collins, since given his "30." Collins was in poor health, yet worked days building a house on his suburban lot, and sometimes became sleepy at night. One night he went asleep and lost more than a thousand words, which Ben filled in when the editor was not looking.

Collins and McInerney worked the wire for five years before meeting in the San Francisco office. As Collins poked his head in the doorway, Ben exclaimed:

"Hello, you bewhiskered old desert rat, how are you?" and threw a lump of coal at him.

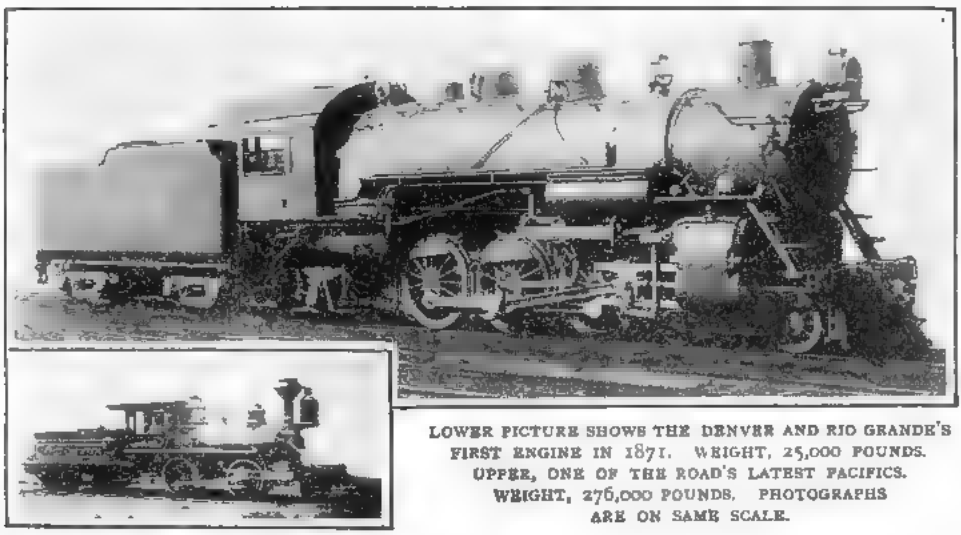
In a few minutes, when Collins passed along Pine Street on his way to the ferry, he jumped several feet as the A. P. manager's swivel chair and a flock of cuspidors crashed down behind him from a second-story window.

Any one needing assistance, take notice. A stranger operator, too tired to work, had sponged on Ben for six weeks. He had disappeared for ten days, and McInerney was wondering what had become of him, when his prototype came in with this note:

DEAR BEN·

This is my friend, Bill Jones. Anything you can do for him will be appreciated the same as for me.

OLD AND NEW ON THE RIO GRANDE.



LOWER PICTURE SHOWS THE DENVER AND RIO GRANDE'S FIRST ENGINE IN 1871. WEIGHT, 25,000 POUNDS. UPPER, ONE OF THE ROAD'S LATEST PACIFICS. WEIGHT, 276,000 POUNDS. PHOTOGRAPHS ARE ON SAME SCALE.

STANDARDIZING RAILROAD PRACTISE.

Over Fifty Organizations Are Constantly Working to Increase Efficiency by Making Rules and Methods Uniform.

BY THADDEUS S. DAYTON.

STANDARDIZATION is the key-note of modern science and industry. In no other business has it been carried to such perfection and on so large a scale as in railroading. To-day practically every railroad in America uses standard time, standard rules, and other standards that are a part of the universal code of procedure in nearly every department everywhere.

The building up of these systems of uniform rules has been one of the mightiest tasks that has been achieved by any industry. Nothing comparable to it has been accomplished outside the railroad field.

Makes Work Easier and Simpler.

These standardizations have simplified the railroad man's work. They have made it easier, because they apply, not to one road, but to all.

A man may go from a road in New England to one on the Pacific coast, and find the rules and standards practically the same as those he has been accustomed to, with the exception of certain minor changes made necessary by local conditions.

Years ago each railroad was run independently of all other railroads. The knowledge acquired by the officials of one company, as the result of costly experiments and experiences, was unknown to the others. Often it was as jealously guarded as a valuable trade secret is by a manufacturer.

Then came the era of connecting railroads and through rates. The problems of transportation grew increasingly complex and intricate. Each road found it excessively expensive to keep on trying experiments and endeavoring to solve its own problems independently of all the rest.

It was discovered that the interchange of ideas and experiences was not only valuable, but absolutely necessary. Then the railway associations were born. They have increased in number and usefulness.

There are now more than fifty of these great national and international organizations, many local associations, and a large number of railway clubs. Even the interchange of ideas is standardized.

A. R. A. Is Biggest.

The American Railway Association is the biggest of the railroad organizations of national scope in this country and Canada. The A. R. A. is the "supreme council of standardization." It derives its authority from the separate companies. The association now has a membership of over 400 companies, operating about 280,000 miles. This is about the total mileage of the United States and Canada.

At a recent meeting the association's committee on transportation announced that it had completed its work on the revision of the standard code of train rules, block signals, and interlocking rules, a task on which it had been engaged for four years. This was as weighty a work as the revision of a nation's code of laws.

Since the entrance of the United States into the war this association's meetings have been postponed.

The work of this association is just as thorough in little things as big ones. Take

the railroad employees' time-cards, for example—the official schedule that every man concerned in the operation of trains has to receipt for.

Look at the current time-cards of the several hundred different roads that belong to the association, and you will find that they are all exactly alike so far as the general wording and the arrangement of the different styles of type are concerned.

This is only one of the many things that is determined by this association. But in everything it does it is guided by the desire to attain results that will raise American railroads to higher and higher standards of excellence and efficiency of operation.

To list all the things that this association does would be tedious to the reader, but here are some of the most important: it keeps track of the car supply and the general performance of freight-cars throughout the country; its committee on safety appliances considers and decides what are the essential requisites of any installation intended to promote safety.

Labors for Ideal Practise.

In other words, it sets up a universal standard, and one that is as nearly ideal as practicable, and causes it to be lived up to. It does not specifically examine and pass on special devices or inventions, but if a device is installed, and it is found to violate or fail to fulfil any of the essential requisites of this standard, it must be made to meet them or be discarded.

The association has also established standards for train-lighting and train-heating. It has originated uniform rules for the examination of applicants for employment or promotion.

That is the reason why, all over the United States, such applicants must conform to such standard physical and mental tests as will show that they will be capable of filling the place they are seeking. These standards were formulated after consulting with the most eminent railway surgeons and other specialists.

The association has also compiled a cipher code for use in sending telegrams. Economy, not secrecy, is the object of this code. It is designed to promote brevity and lessen the volume of work of telegraph operators.

It may also be news to the younger generation of railroad men that the standard gage of 4 feet 8½ inches was established by the American Railway Association. This was in 1897. The Master Car Builders had fixed on a wheel-gage and wheel-section three years earlier, and the year following the adoption of a certain standard section of rail by the American Society of Civil Engineers.

When There Were 50 Kinds of Time.

The American Railway Association was formed as a result of the first of the great standardizations—that of time. The history of the standards of time now used in this country has been told so often that a brief outline will be sufficient here.

In 1872, when the standardization of time began to be agitated, there were more than fifty different kinds of time in use on the principal railroads that were running trains on through schedules. Finally the railroads got together and called a general convention to consider the matter.

The late W. F. Allen, who subsequently became the secretary of the American Railway Association, was the secretary of the time convention, and it was largely owing to his labors that the present system was placed in effect, November 18, 1883.

Committees of the general time convention collected and tabulated all the signals used by all the different railroads of the country, and classified their significance. Then they formulated what is practically the present code of hand, lamp, whistle, color, and bell-cord signals.

This was adopted throughout the United States on November 16, 1884.

How this code was decided upon is interesting. It illustrates, probably better than anything else, the basic principles of standardization on which the whole vast system has been reared.

In those early days, although the development of signals had been along much the same lines on different roads, they were not by any means uniform. On that account there was always great danger of accident at terminal stations or where

different roads crossed. The same signal might mean two different things to two different employees.

Also, when a man who had been working on one road went over to another, it took him some time to get accustomed to the new signals. This was another source of danger.

So, when the committees sought to standardize these signals, they went to the heart of the matter at once. They decided that hand signals, for instance, should be based on the most natural human impulses. They said:

Common Sense the Father of Signals.

"Let's stand by a railroad track. A train is approaching. We want to let it go by. There is no reason why we should stop it.

"What would we do? Nothing.

"But the engineer wants to know that everything is O. K. Well and good. We're standing in an upright position with our arms at our sides. Let's raise them perpendicularly above our heads and hold them there. That's a clear sign.

"Now, suppose the train is standing still, and we want to signal it to go ahead. That signifies motion. There should be some action about that signal.

"Very well. Let's make that by raising and lowering the arm vertically, either with or without lantern or flag.

"Now, if a man wants to stop a train, what would he do? Rush out on the track and wave his hands across it, probably. Therefore the stop signal should be to swing the hand, flag, or lantern back and forth horizontally."

Rule of Reason for Air-Brake Code, Too.

This is the way the first standard hand signals were worked out. The others that were subsequently adopted, such as the signal to apply air-brake or to release it, were arrived at by much the same process of reasoning, and have become standard all over North America.

When block signals came into use, they followed the same code. The safety position of the semaphore-arm is at perpendicular; the danger, at horizontal; and the caution, with the arm extended diagonally. The general time convention changed its name in 1891 to the American Railway Association, and the standardization of rules and methods was continued by the formulation and adoption of the first standard code of train-rules. There was even greater need for standardization in this respect.

There was a vast variety of rules in use throughout the country. It was a perplexing task, but when the association got through with it the result seemed perfectly simple.

The new book gave rules for single and double track operation. It specified the form and application of telegraphic train-orders, block-signals, *et cetera*. It has been revised from time to time, as the advance in the science of transportation has created new conditions, but fundamentally it has been changed but little.

A fairly condensed account of what the American Railway Association has accomplished would fill several large volumes. It has discussed every problem of operation and construction, and its decisions have been generally promptly conformed to by every important railroad.

Master Car Builders' Great Achievement.

The Master Car Builders' Association has had a different task in the standardization of equipment and the rules for its repairs, but one so vast and complex that it seems amazing that the present comprehensive system ever could have been worked out.

The Master Car Builders' Association was organized in 1867. Its first object was standardizing the construction of both passenger and freight cars along the most desirable lines.

Year after year these men—the greatest car-builders in the world—have toiled over such seemingly simple things as the inner and outer dimensions of cars and the best place for each bit of material that went into their construction. Every nail, rivet, and screw, every bit of wood or iron, has been studied and its position decided upon.

The result is that to-day practically all the cars built in the United States are

built in conformity with the designs and rules approved by the association. The parts are so standardized that nearly every car of any railroad can be repaired at any railroad shop with wheels, trucks, pinions, bolts, and the myriad other things that enter into its composition.

All these parts are each of the same pattern, size, quality, and finish for each type of car. Everything is in strict accordance with the M. C. B. rules. How convenient and economical this is may be inferred from the fact that the standard passenger-coach has more than five hundred different parts, each having a specific name.

The standardizing of the plans for car-building, although it was a big task, was far easier than the standardization of the rules for repairs. In repairing cars there always arose the oftentimes disagreeable and always vexatious question:

"Who's going to be responsible for this expense?"

Car repairs are usually made necessary from three general causes: accident that is not the fault of the car, defects caused by previous injuries, and ordinary wear and tear.

One of the first things that the Master Car Builders' Association decided upon was a sort of golden rule. It is this:

"Each company must give the same care to cars of other companies that it does to its own cars."

Joint Inspectors Maintained at Junctions.

The association also formulated a code of rules to govern the condition in which cars must be maintained in order to pass inspection at junction-points, and to provide for their repairs. It brought about the appointment of the joint car-inspectors that are now located at points where several roads meet and many freight-cars are exchanged every day.

These car-inspectors and their men inspect, systematically and carefully, the structural condition of every car that arrives, and do not allow it to proceed without making a record of repairs.

The Master Car Builders' Association has devoted many years to investigating and experimenting with innumerable types of car-couplers, and designates those which are acceptable for use.

The rules and recommendations of this association are subject to many more changes and modifications than those of almost any other railroad organization.

These are brought about by the continual progress of the science of transportation in the direction of cars of larger capacity and improved pattern. Steel cars and wooden cars with steel underframing have received much of its attention during the last ten years.

An important work of this association is the preparation and publication of the Master Car Builders' Dictionary. It has a page 8x12 inches. There are nearly 200 pages of definitions of parts of cars, and about 600 additional pages containing nearly 7,000 cuts and diagrams.

This dictionary was first published in 1895, and has since been revised.

How Doctors to Sick Engines Get Together.

The American Railway Master Mechanics' Association was organized in 1868, and has done for the locomotive what the Car Builders' Association has done for the cars it hauls. The proceedings of this association would be as intelligible to the ordinary railroad man who is not intimately acquainted with the parts of a locomotive as a report of a convention of doctors or surgeons.

In fact, the anatomy of a locomotive is about as complex as that of a human being, and one needs about as much care as the other to keep it in order.

While there is little or no interchange of locomotives, as there is of cars, yet, when a road has many engines, the necessity of standardization is obvious. The standardizing of types has been carried out successfully. This has resulted in a reduction in the costs of building and keeping in repair.

To the Master Mechanics' Association is also due much of the credit for the many improvements that have been made in railroad power and general efficiency.

The American Railway Engineering Association has done much to improve the construction of roads, and the Maintenance

of Way Associations have established standards for the construction and maintenance of track. The American Railway Bridge and Building Association, as its name implies, concerns itself with the improvement and uniformity of these important structures.

Keeping Cases on Wandering Freight-Cars.

The Association of Transportation and Car Accounting officers have had an unusually complex task. There are about two and a half million freight-cars in the United States, and from twenty-five to fifty per cent of these are constantly away from home. They are on tracks other than those of their owners.

The only way in which their wanderings can be traced and each car be accounted for is by a complex system which depends for its success on standardization and cooperation among the various railways. Each road must keep its car records in exactly the same form.

It takes a stupendous amount of detailed work to keep these accounts straight, for they involve not only tracing the actual movements of the cars, but making a *per diem* charge against the roads using each of them.

This seemingly impossible task, however, has been accomplished. The general principles of the system are like the rules of a great clearing-house where cars are the items instead of checks.

This association also issues a monthly publication which gives in detail all the information concerning the dimensions, capacity, *et cetera*, of the freight-cars in service on each road. Every three months it publishes a bulletin showing the clearances of tunnels and other "restricted surroundings" of the track on each road. This is so that every one concerned may be able to tell instantly whether a car of certain dimensions can be hauled or not.

Knights of the Key Have Their Association.

The Train Despatchers' Association of America was organized in 1888. It has evolved the standard rules and methods of moving trains by telegraphic orders. It has originated special forms for this purpose and has cooperated with the American Railway Association in the revision of the standard train-rules.

The Association of Railway Telegraph Superintendents has improved the construction of telegraph-lines and the methods of telegraph practise in general

The American Association of General Passenger and Ticket Agents first met in convention in 1855. It was one of the first, if not the first, of these organizations formed for the promotion of railway standards.

Its primary object was to arrange the details involved in the preparation, sale, and acceptance of through tickets. Like most of the other associations, it meets annually. It is now known as the American Association of Passenger Traffic Officers.

It has developed the system whereby a ticket can be purchased at almost any railroad station in America for travel to nearly any other railroad station. It has also arranged the publication of through rates of fare and their apportionment on a percentage basis between different lines. Much of the detail of this work is now handled by local associations.

Those Versatile P. T. O.'s.

It also has standardized the forms of local and through tickets, especially the latter, and has established an organization for the protection of railways from the misuse of tickets through alteration or forgery.

As an example of the diversity of the matters in which the committees of this association are engaged, take some of the topics that came up at a single annual meeting. At this meeting it adopted a standard telegraph cipher code for handling interline passenger-traffic business. This not only reduces the expense of telegraphing for sleeping-car reservations and similar matters, but also saves time in ciphering and deciphering.

It secured a patent on the association's form of multiroute ticket. These tickets are printed on association paper and in colors that are standards for all roads.

The folder committee standardized the rules for the distribution of folders in hotels and other public places, and was empowered to exercise a close supervision over it.

A uniform place on all tickets for the punching of half-fare, second-class, and baggage checked was arranged.

While this association is not a legislative body, and cannot enforce its recommendations on the railroads, its great importance is in originating, investigating, and discussing subjects to be referred to the various territorial associations.

Every large railroad company has on its staff a corps of experienced surgeons, located at convenient points on the line so that their services may be promptly available. These surgeons have an organization which has for its object the development and improvement of railway surgery, and especially the study and investigation of medical, legal, and sanitary subjects related thereto. They have standardized their forms of reports and many other things connected with the routine of their work.

The Association of American Railway Accounting Officers was organized in 1888. One of its earliest and most important achievements was the improvement and extension of the interline way-billing system.

In connection with the Interstate Commerce Commission it has formulated a classification of accounts. It discusses and determines problems of railway accounting.

It has standardized methods of ascertaining balances between the different companies, and has brought about a prompt settlement of these balances, as well as many other improvements.

The Maintenance of Way Master Painters' Association lays stress on paint as an aid in making the public more friendly to the railroads, through beautifying the stations and their surroundings. It discusses such things as the standardization of methods of cleaning bridges and other steel structures. One of its tasks has been the standardizing of paints in use by various railroads.

In all there are four associations in the maintenance-of-way field: the one just mentioned, the Bridge and Building Association, the Roadmasters' Association, and the American Wood Preservers' Association. Each of these takes up the standardization and improvement of the work that is directly connected with its own division of the field.

The Railway Signal Association seeks to develop and standardize the rules for the construction and maintenance of railway signaling appliances, and to improve signal practise generally.

The Association of Railway Claim Agents has standardized forms and methods of handling personal-injury cases, and the Freight-Claim Association has done the same in the much wider field of claims arising out of the handling of freight, and has decidedly simplified the passage of these claims through their proper channels.

Other associations are: the Air Brake Association, the associations of Demurrage Officers, Dining Car Superintendents, Freight Agents, Railroad Superintendents, Electric Railways; Master Tinners, Coppersmiths, and Pipefitters; Tool Foremen, Manufacturers of Chilled Car Wheels, Electrical Engineers, Bridge and Building Supply Men, Car Foremen, General Superintendents, Master Blacksmiths, Boiler Makers, Master Car and Locomotive Painters, Electrical Supply Manufacturers, Storekeepers, Railway Supply Manufacturers, and Traveling Engineers.

Many of these associations have postponed their meetings indefinitely, owing to the war. However, the work they have already accomplished would endure even if they never met again.

Such are the agencies for standardizing railroad practise in times of peace. The extraordinary functions and arbitrary powers exercised by the Railroads' War Board, organized by the steam carriers of the United States immediately after this country's entrance into the present world conflict, are more fitly discussed in the article entitled "U. S. Government—Expedite!" with which this number opens.—EDITOR.

UNCLE SAM'S BRIDGES ARE SAFE.

NO JOB TOO HAZARDOUS FOR THESE "STEEPLE-JACKS" WHOSE LOFTY PERCHES GIVE A COMMANDING VIEW IN ALL DIRECTIONS.

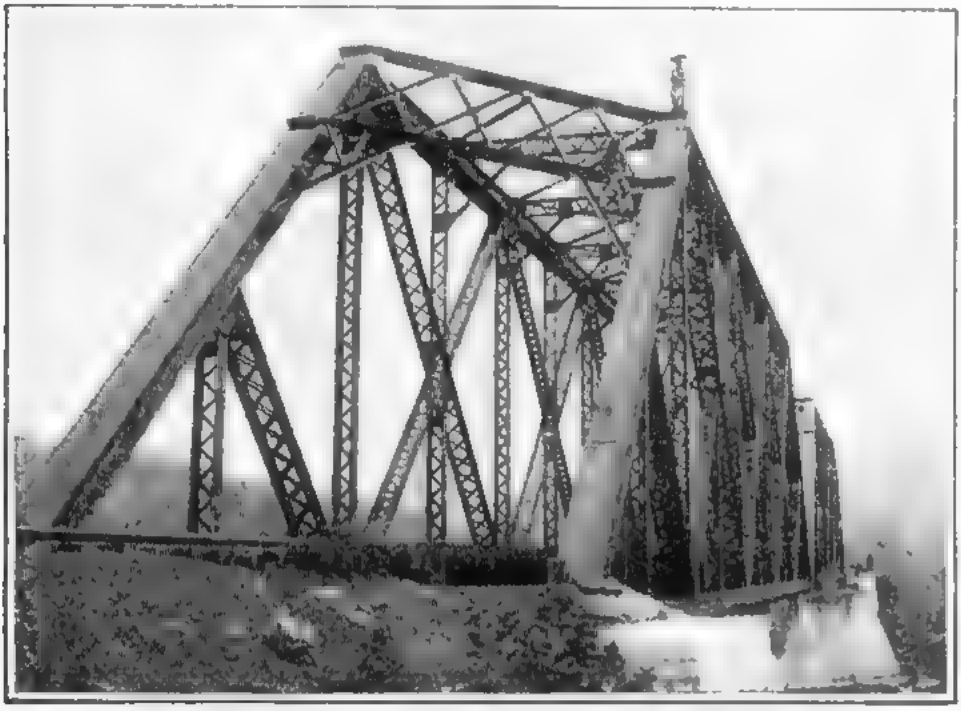
"GUARD the bridges!"

That was the cry that went up on all sides when Uncle Sam went to war six months ago. Every one realized the great danger of our mammoth bridges being blown up

In some of the larger cities, such as New York, such a disaster might mean blocking the waterways, and thus hampering several giant dreadnoughts. The railroads, too, would suffer irreparable damage; and the transportation of troops and equipment would be affected vitally by accidents to our bridges.

How efficiently the situation is being handled is shown by the fact that in a half-year of war not a single bridge of any size in the country has been blown up.

Soldiers have been stationed on all the big steel structures, and a constant vigil is kept. Every loyal citizen has good reason to congratulate the gallant American soldiers on the efficacy of this watch.



EVERY IMPORTANT BRIDGE IN THE COUNTRY IS UNDER CONSTANT GUARD.

YOUNG ORDEN PUTS 'EM IN TO CLEAR.

BY WILLIAM WALLACE COOK,

Author of "The Road to Antioch," "Running the Signal," "The Paymaster's Special," etc.

When Judge Bryde and His Gang Trimmed This "Wise Guy" They Started Something That Was Sure Ominous.

A FIVE-PART STORY—PART THREE.

SYNOPSIS OF PREVIOUS CHAPTERS.

YOUNG Guy Orden's hermit Uncle Sim turns him loose with a riding horse and one thousand five hundred dollars, telling him to report in a year to his other uncle, George, a rich business man, of Los Angeles. In Arizona Guy hears the story of Pete, the Bonanza Burro, an animal once owned by a prospector named Riordan, who was killed shortly after he had discovered a wonderful pocket of gold, the location of which Riordan had kept hidden. This burro, it is thought, might be induced to lead the way to Riordan's secret strike. Guy trades everything he has to a gang of swindlers for a burro doctored up to resemble Pete. The gang consists of Judge Bryde, Colonel Copperthorne, and one Grimsby.

Guy resumes acquaintance with beautiful Mollie Harper and her trifling brother, Lee, and saves them from being robbed by Grimsby, who now operates under the name of Grimshaw. He also procures Grimshaw's arrest for borrowing one thousand dollars from Leavitt, the superintendent of the Montezuma Mine, using a fake pearl necklace as security.

Mollie rejects Guy's proposal of marriage on the ground that she is engaged to Rolfe Barstow, a mining engineer. At the same time Guy learns that his Uncle George predicts his utter failure. These rebuffs make him only more determined to succeed.

CHAPTER XIII.

ON THE SAN BENITO.

RDEN called at the headquarters adobe one morning, and asked for his time. He had put in just a month at the Montezuma Mine.

"What seems to be the matter, Orden?" asked the superintendent.

"I've got to make more money, Mr. Leavitt," was the answer.

"Suppose we jump you to seventy-five a month?" Orden smiled.

"You'd have to jump me to a couple of thousand a month," said he, "in order to make it an object for me to stay."

Leavitt took this as a joke.

"There's something up your sleeve," he averred, "but it's none of my business. Sorry to have you leave, though, as I've taken a liking to you. If you get next to anything that promises big returns on a small investment, I'd be glad to use a little money."

"All right," said Orden. "By the way, what's going to be done with Grimshaw's horse and riding-gear? He owned the outfit, didn't he?"

"He did own it, but now it's mine. You see, all he had in cash was the fifteen hundred he turned over to me, and he needed money to pay his lawyer. I took over the horse and equipment at a bargain."

"Will you sell?"

"For a hundred, yes."

"Good! Keep what's coming to me, Mr. Leavitt, and I'll pay the difference."

The matter was quickly disposed of, and when Orden was ready for the trail he had under him a fairly good horse and more than four hundred dollars in his pocket. He had avoided Mollie Harper since that fateful interview in the pass, but he did not want her to remember him as a cad and so he halted at the adobe on the way out of camp.

"You are going away?" Mollie asked.

"Yes," said he, "and for good. I couldn't leave without bidding you good-by."

"I should hope not!" she exclaimed. "Lee and I will be leaving soon, but we expect to do a good deal of traveling between the San Benito and Montezuma. Possibly we shall see you again, Mr. Orden?"

"Possibly; but, whether you see me again or not, I want you to know that I wish you prosperity and happiness. Furthermore—"

"Prosperity will come," Mollie interrupted, "and Lee and I realize that we owe most of it to you."

"Furthermore," proceeded Orden, "if the time ever comes when I can help you, you will not let anything that has happened stand in the way of calling on me?"

She flushed under his steady look; then, lifting her eyes and meeting his gaze steadily, she gave him her hand

"No," she said.

He released her hand quickly and turned away to mount his horse. She stood in the door of the adobe and watched him as he rode off up the valley.

Although Rolfe Barstow had come between them, and they talked over his shoulders with noticeable constraint, an abiding friendship was indicated by the warm, firm pressure of their hands.

That night Orden was in Prescott. Next morning he equipped himself with a grub-pack and a gold-pan and pointed his horse for the San Benito. He had learned, days before, where Andrew Blake had located his placerings, and when he reached the stream he rode up its winding course toward the gravel bench

Like most Southwestern water-courses, the San Benito was a tricky stream. In one place it was a mere rivulet; in another place it disappeared altogether, sinking beneath the sands and flowing on bed-rock; again, it would be forced to the surface in a broad pool and flow for perhaps a mile like a well-behaved river.

At Castle Creek Cañon Orden had been well-trained to detect traces of yellow metal. He could read a country for "indications" as he would have scanned an open book.

Observation convinced him that there was no gold in the hills bordering that part of the San Benito's course. Nevertheless, he continued on to the new Harper holdings, and here the San Benito looked like a real stream, executed a sharp turn, and in the hollow of the "elbow" had thrown up the gravel bench. The formations were right for good placerings; and if the San Benito tapped gold at its head-waters the current had surely brought it down in particles and lodged it at the bend.

It was noon, and Orden picketed his horse near water and forage, lunched on his cold rations, removed shoes and stockings and waded into the river with the gold-pan. He got "color" at his first try, and after two hours of digging toward black sand he washed out a small nugget.

The placerings were good, as placerings went in that country. Possibly five dollars a day could be made if one was industrious; and down next to bed-rock, of course, there remained the promise of larger gains. Going back to the shade of the mesquite-bushes, Orden put on his stockings and shoes, lighted his pipe and dropped into reflection

The Harpers had not been swindled. Barstow's advice had been reliable, and the placerings had been bought at a bargain. Orden had come to the San Benito in order to settle that important question for himself. It was in line with his determination to continue doing what he could for Mollie

He had wondered why Grimshaw had been so anxious to secure Blake's property. That point was clear, now. Grimshaw had merely outbid the Harpers in the hope of acquiring valuable placer ground for himself.

Thousands of dollars would be needed in buying a pump to clear of water, and keep clear, the shaft and levels of the Harpers' mine in Montezuma Valley. This placer ground might yield a sufficient stake for developing the mine, but before that stake was garnered months of heart-breaking labor would have to be done

And most of that work would fall upon Mollie. Lee, fretful, complaining and far from physically fit, was bound to be more of a drag than a help.

"Barstow must have known that," muttered Orden, "and yet he advised Mollie to buy the placerings! If he had used good sense and judgment, he would have looked ahead far enough to take stock of the girl's difficulties. But maybe," he added, his resentment softening, "Barstow intends to help in some way."

Orden had formed no hard-and-set plans for himself. Since Uncle George had little patience with any one not a money-maker, the nephew was determined to try for his favor along the lines of business success

His comparatively small wage at the Montezuma would not have swollen his finances much in a twelvemonth. It was necessary to do better, much better. Yet, the way to a large pecuniary success was not clear.

Prospecting for gold, Orden knew, occa-

sionally leads to a quick turn of fortune's wheel. In the absence of anything else, he was inclined to try prospecting.

Uncle George, along with his business of selling stocks and bonds, now and then took a flyer in mines. But he knew the dangers menacing such investments, and had yet to be caught in a wildcat scheme.

He was shrewd, and able to make money where others lost. Prospecting and mining, in short, brought uncle and nephew together on at least one bit of common ground.

If Orden's dreams could have been laid bare to the public eye, he would have been seen in fancy discovering a second Comstock Lode, getting Uncle George to finance it, and then climbing to affluence in a get-rich-quick manner that would have won loud applause from the gentleman in Los Angeles. Such dreams, however, come true about once in a million times; so the bright possibilities were not deceiving Orden.

He felt, too, as though he must even up matters with Bryde and Copperthorne. Already he had settled his personal account with the least resourceful of the three sharpers. Grimshaw was in a fair way to pay the penalty of his swindling tactics.

But, so far as complete retaliation was concerned, the affair with Grimshaw was only a small start. The hunting-grounds of the judge and the colonel were the whole Southwest. In his coming and going through the deserts and among the hills, Orden hoped that fate would be kind enough to throw his trail across that of the master schemer and his efficient aid

The sun was near the horizon when Orden mounted and rode on up the San Benito. It was his intention to win to the settlement of Buenas Noches for the night, and he had halted so long at the placerings that it would be a late hour before he reached the town.

He spurred briskly onward, and at sundown came upon a small fire kindled near an overhang of the river's bank. Over the fire a Mexican was frying bacon, and a pot of coffee boiled on the edge of the coals.

"Hello!" called Orden, drawing rein.

The Mexican nodded and gave the horseman a quick scrutiny.

"That coffee smells mighty good, friend," said Orden, "and with some cold grub which I have in this haversack I think you and I might make out a square meal. How about it?"

"*Bueno!*" agreed the Mexican, and smiled widely.

Orden dismounted, buckled the reins about a white thorn bush and untied his sack of rations from the cantle. He dropped the bag by the fire and seated himself.

"You prospecting, eh?" inquired the solitary camper, his eyes wandering to the gold-pan dangling from Orden's saddle.

"Yes."

"Luck?"

"No."

"Dat is *muy malo*. Me, I prospect, too, *señor*. Dat gol' is ver' hard to find."

"You are right about that. My name is Orden. What's yours?"

"Pablo Gonzales"

Gonzales went to his burro, hobbled at a distance in the gathering shadows, and returned with a battered tin cup, a fork and a tin plate. These were for Orden. Gonzales ate from the frying-pan, and waited for his coffee until Orden had finished with the cup.

The talk was on general topics during the meal. When it was finished the Mexican rolled a cigarette and Orden filled his pipe. The hour was pleasant, with the stars coming out overhead, the camp-fire smoldering, the river gurgling musically, and the evening air soft and refreshingly cool.

"Mebbyso," Gonzales remarked, "you look for dat Riordan pocket, huh?"

For the first time in a month Orden's mind reverted to the dead prospector and the mysterious treasure upon which he had drawn so liberally.

"I'm not looking for the pocket, Gonzales," Orden answered, "and I haven't an idea in what part of the country it is located. That story about Riordan's pocket is a good deal of a fairy-tale, don't you think?"

"*Quien sabe?*" said the Mexican, spreading out his hands with a shrug. "This mining-district is de Riordan district, *señor*. Me, I know dat. When odders try for follow Riordan, and miss out, I see him once wid de burro goin' troo de hills to dat pocket. *Sí*, wid my own eyes, I see 'im. In dis district is de pocket, yas."

"It would be a hard thing to find, Gonzales. Without a clue, a man could put in a year combing the hills and hog-backs, the gulches and *arroyos;* and then he'd fail."

"I got de clue, *señor*. You wait."

He threw some dried brush on the fire and then, through the gloom, went to his burro and removed the hobbles. Returning with the animal, he brought it near the fire.

"You see?" he asked. "Dis burro Pete, Riordan's Pete. De crop ear, de lame foot,

de *blanco* streak on de back. You know 'bout dat Riordan burro?"

For a moment Orden sat like a man stunned. Then he got up and made a close and thorough inspection of the animal.

CHAPTER XIV.

A CHANCE AT FORTUNE.

THERE was nothing counterfeit about that particular burro. This animal was genuine.

"Gonzales," said Orden, in some excitement, "you have a fortune in this burro, providing that story of Riordan's pocket is true."

Again the Mexican shrugged.

"I sell you dat burro for *cinque pesos, señor,*" he returned.

"You must know that there are dozens of people who would give a fancy price for Riordan's Pete. Why do you want to sell the animal for five dollars?"

"Him no good. *Par dios,* he not got de sense for follow dat same trail he go wid Riordan. I try him for weeks. You gif me *cinque pesos,* you take Riordan's Pete."

Orden was wary. This looked too good to be true.

"Where did you get the burro?"

"I buy him from anoder *Mejicano* who look for dat pocket. Dat oder *Mejicano* got him I don't know. Same as me, dat oder *Mejicano* hunt and find de Pete burro no good. Same as you, I t'ink, mebbyso, he not hunt right. So I buy Pete for *cinque pesos,* and now I sell him for *cinque pesos,* if you was fool enough to buy. I am disgust.

"Pete not wort' dat," and he snapped his brown fingers. "How he act wid a load, eh? He lay down, *si,* and he not move if de pack weigh so much as ten pounds. You buy him?"

Orden had come to think that the Bonanza Burro had been very much overrated by the vivid imagination of the Southwest. There had been a prospector named Riordan and he had made a rich "strike," and the lame, crop-eared burro with the white streak had been his pack animal.

These were facts, well attested. The idea that Riordan's Pete could lead a person to the treasure pocket was not Judge Bryde's. Many others in the Southwest were under that impression. The judge and his confederates had merely appropriated the idea and worked it out for their own benefit by counterfeiting the original burro.

There might be something in the Riordan story. There was a chance that fortune was beginning to smile upon Orden. And he was not called upon to risk a great deal on the venture. He took five silver dollars from his pocket and handed them to Gonzales.

"You could get a fancy price for the burro in any of the settlements," asserted Orden.

"No, *señor,*" and the Mexican laughed as he pouched the money, "dat is not true. All de country is full of Riordan's Petes. *Si! Americanos* make up burros to look de part, and dey is sold for fancy price too long. Now people say, '*Mañana*' and wink de eye w'en ever dey see one of dose Riordan's Petes. Dat hurt de sale of de real burro of Riordan *Sabe?*

"Now you got 'im, de real Riordan's Pete, but he no good to find dat pocket, no good to sell for fancy price. I go back to haul wood, now. Better dat as chasing de rainbows."

Gonzales began collecting his scattered camp equipment. When he was ready to leave, his gear on his back, Orden detained him for a little further information.

"You say you saw Riordan when he was on the way to the pocket?"

"*Si.*"

"Just where was he, at the time?"

"You know de Maricopa trail from Buenas Noches?"

"No, but I can find it."

"You travel dat trail to de water-hole, *señor,* den you turn and make for Tres Alamos butte. At de bottom of de butte, on de right-hand side, is w'ere I see dat Riordan wid Pete. But dat burro act for me at de butte lak he dont know nodding."

Orden jotted the information down in his mind, and Gonzales went his way.

Three hours later Orden rode into Buenas Noches, hauling Riordan's Pete behind him at the end of a picket-rope. There was a small hotel in the town, and back of the hotel was a corral of *okatea* stakes braided with wire.

The landlord, one Bankson, came with a lantern to help Orden take care of his live stock. At sight of Riordan's Pete, Bankson exploded a laugh.

"What's the joke?" inquired Orden.

"These lame, crop-eared burros has got to be a joke from the Mexican line plumb to Flagstaff," was the reply. "At last accounts, there was a round dozen of Riordan's Petes in the country, with all kinds o' people tryin' to pass 'em off for what they could get.

"The real Riordan's Pete is dead and planted. I happen to know that, stranger.

"What 're you tryin' to do with this ani-

mile? If you bought the critter for spec'lation, then you was stung proper. Nobody would take him as a gift. If you're aimin' to locate that fool pocket with the brute, then you're stung a heap worse.'

"All right," said Orden cheerfully. "Pete will be safe for the night, will he?"

"Safe? Thunder! Why, you couldn't give that critter away in this man's town. This was Riordan's home port, although he didn't gen'rally start for his pocket from here. He went out from diff'rent places, aimin' to fool the folks that follered him.

"Back o' town, on the hillside, is where Riordan was buried; and in the hotel I got his sawbuck pack-saddle, the three-tined fork on a pole that he used for a prod, and the bell he tied around his burro's neck.

"What that bell was for nobody ever guessed. Riordan allers kept it strapped around Pete's neck, howsumever, when goin' and comin' through the hills."

"I'd like to buy the Riordan relics, Bankson," said Orden.

"They used to be drawin' cards in the early days of the Riordan pocket excitement, but now there ain't one person a month comes to look at the relics. I reckon we can deal."

"What else do you know about Riordan?"

"He was a queer duck, but silent like. Jest moved around like he was deef and dumb. He'd talk to Pete on the trail, same as if the burro was human, and when he prodded with the fork he'd say, 'Woof-a-boy, woof-a-boy.' It was as good as a circus to see Riordan comin' down the trail, prodding the burro on the off-side and crying 'Woof-a-boy!'"

"Anything more about Riordan?"

"Nary. Mighty little anybody ever learned about Riordan. If the real Pete was alive, and could talk, I reckon he could let in a heap o' light."

"What makes you think the real Riordan's Pete is dead?"

"Well, two men got into a fight over one o' them Petes, out to the water-hole. Both men claimed the critter, and they played a game o' draw to see which should have the animile. Feller that lost swore t'other feller took two aces out o' his sleeve.

"Then they played another kind o' 'draw,' and guns popped right smart. A bullet went wide and killed Pete. Then them two ombrays put up their guns and shook hands. I went out to the water-hole, and it's my idee the real Riordan's Pete was the one a layin' there in the chaparral. I seen the real Pete more'n a dozen times, and couldn't make no mistake."

Next morning Orden bought the late Riordans "relics" for twenty dollars. When he rode out of town, he carried the pole with the fork lashed to the end, the cowbell was hung from his saddle-horn by its looped strap, and behind him he dragged Pete, burdened with a grub-stake balanced on the sawbuck pack-saddle.

The few inhabitants of Buenas Noches were assembled in the main street to enjoy the prospect of another dupe faring forth to locate Riordan's pocket. Orden took the joking in good part, and made his slow way to the water-hole, five miles from the town.

After an hour's rest he went on to Tres Alamos butte. At the foot of the uplift, on its eastern side, he dismounted and removed the picket-rope from the rebellious Pete. The burro promptly lay down under the pack.

"Gonzales was right about you, Pete," said Orden, beginning a one-sided conversation after the manner of the burro's former master. "I have an idea, though, that you were not handled properly by Gonzales and the other Mexican. You were used to certain things, when in the service of Riordan, and no one could expect a burro to recall an old trail unless circumstances were duly considered.

"Years ago, before you dropped into Riordan's hands, you must have been bell-burro for a pack-train, somewhere in Northern Mexico. So it's the bell you need to keep you going. Here!"

He removed the bell from his saddle and strapped it around Pete's furry neck. Then, pushing an arm through the looped reins of his riding-horse, he took up a position behind the burro and prodded the brute on the off-side.

"Woof-a-boy!" he cried. "Woof-a-boy!"

The burro looked around, ears wagging.

"Woof-a-boy! Woof-a-boy!"

Pete shivered and got slowly erect. Old times were upon the burro. Things he had been used to were happening. Grunting, and with head lowered, he moved forward around the base of Tres Alamos butte.

"The idea is, Pete," said Orden, tramping along and leading his horse, "that you are to lead the way to Riordan's pocket. I am trying to make the circumstances as much like they were in the old times as I possibly can.

"Of course, you're not deceived in me. I'll warrant you understand very well that I am not Riordan. Still, you might overlook that point in view of all the trouble I'm taking in

this matter. Which way now? Woof-a-boy! Woof-a-boy!"

Pete had paused in a shallow valley, stretching in a northwesterly direction from the foot of Tres Alamos butte. Two prods of the fork, accompanied by the old words of encouragement, sent the burro steadily up the valley. He showed no uncertainty as to direction, and his lagging was due to a disposition the reverse of ambitious.

A mile up the valley and Pete swung to the left and climbed the gentle slope to the crest of the "rise."

"You're coming splendidly, Pete!" cried Orden, whose nerves by this time were tingling with a pleasant excitement. "I've proved that you will tote a good-sized pack, and that your bump of locality can be depended on if appealed to in the right way.

"Allowing a burro to lead a person to a treasure is a peculiar proposition, at best. If instinct is to do the trick, it must be set to work by familiar conditions. Woof-a-boy!"

Pete dragged over a level stretch of desert toward an opening in a chain of low, sun-baked hills in the west. The cow-bell *clang-clanged* its weird notes as its bearer limped along.

"It would be a wonderful thing, Pete," pursued Orden, "if I could find your old master's pocket and take out of it a good-sized fortune. That would be turning the tables very neatly on Judge Bryde and Colonel Copperthorne.

"Why, if I could recover no more than seventeen hundred dollars all this maneuvering would be worth while. You see, that is the sum I lost on that confounded counterfeit Bonanza Burro.

"Woof-a-boy! Woof-a-boy! You are laying a straight line for an opening in the hills, Pete. It must be that you know exactly what you are doing. Ah! there's green, in there, and I imagine we'll find water."

Pete limped into the mouth of an *arroyo*, pricked up his ears, increased his pace and presently halted at a small pool of water, fed by a trickling spring among the rocks. Pete dropped his head and began to drink; then, backing clear of the pool, he lay down contentedly.

Orden had ceased to pay any attention to his four-footed guide. The base of the hill, beyond the spring, was crannied by a V-shaped cut. Here there was sand, dug up by human hands and flung into fantastic heaps. Orden, with a queer sensation ruffling his nerves, left his horse, scrambled over the sand heaps, and presently stood looking down at a rusty pick and shovel and an old and battered gold-pan.

"I've found it, by George!" he shouted. "Riordan's pocket is here, and the burro has led me to it!"

Almost overcome with excitement, he flung himself into the cranny, dropped to his knees and began pawing at the sand and gravel with his bare hands.

It was too dark for an examination of Riordan's treasure-chamber, so Orden found it necessary to smother his impatience until the following morning. Then, with sunrise, he made the staggering discovery that the pocket had been emptied of every particle of its gold.

(To Be Continued.)

THE OLD FLAGMAN ON ELECTRICITY.

BY OLIN LYMAN.

I SEE by the pa-a-pers
The juice has the call,
An' stheam will soon be
With the divil an' all:
"No pushee, no pullee"—
The chink had it right;
'Tis a witch av a world!
Will yez give me a light?

I RAYMIMBER a day
On a pioneer thrack
Whin a mogul's big belly
Put kinks in me back.
Aw, thim was the days!
But the mogul is gone;
'Twill be grade-crossin's next:
I should worry! G'wan!

On the Editorial Carpet

Where We Gather in the Hut, Tell Our Troubles, Help One Another, and Sing Some Old Songs.

YOU who have been following with such interest Mr. Charles Frederick Carter's new series of articles on Big Railroading, will be pleased to know that he has written two more about the New York Central, thus making four articles in all about this queen of passenger systems Next month he will tell you how the Central expended the almost incredible sum of six hundred million dollars in improvements within the space of sixteen years. The month after that he will give you an insight into the methods by which the company's system of iron discipline is enforced with the approval and even with the aid of the men themselves, and will conclude with an account of the adventurous work of the railroad police.

Then there will be a story about the building of electric locomotives, which is based on a visit to the works at Schenectady, and another about the biggest dividend-earning line in the country, the Pittsburgh and Lake Erie, as well as about its head, the wonderful Colonel J. M Schoonmaker, a miracle-worker in railroad operation if ever there was one

But this isn't all of the good news. For after cleaning up along the New York Central's right of way, Carter packed his grip again and hiked out for the Union Pacific. He's just written us a letter to which we gave a title- just as if it were a story—thus:

OVER THE OVERLAND TRAIL.

CARTER will soon be at his typewriter busily recounting his experiences, and you will get the results as soon as the articles outlined above shall have been published. Before we come to Carter's letter it is appropriate to remark right here that if you think the New York Central stories absorbing you'll think the Union Pacific series no less than enthralling No Eastern road can have the romantic history of the Union Pacific, as Carter's letter will readily suggest Here is his epistle in full.

Prospecting for copy on the Overland Trail partakes of the nature of a triumphal progress, a joy-ride, and a bonanza strike. Everybody, from the president of the Union Pacific right down the line, has treated me as if the supreme end and aim of his existence were to see that I got all I wanted and as much more as he could think of

Western hospitality—why, they are so courteous and obliging that I want to live on the Union Pacific forever and ever—would not care to die, even if my funeral expenses were guaranteed. The Overland Trail is such a superb bit of railroad that riding thereon is pure delight, particularly in the dining-car.

Well, why not?

Didn't Lucullus earn immortal fame by feeding himself? And Luke had nothing on Union Pacific dining-cars I'll tell you all about them, unless I am foundered before I can break away

But speaking of copy, here is where it grows, rank and luxuriant. The history of the first transcontinental railroad is still alive and kicking, especially when it has to go in the hole to let the Limited by.

They have been lining up the early chapters for me; telephoning 'em please to go down to the hotel and tell Carter all about it. They come, and pour out such a wealth of thrilling, absorbing stories of by-gone days that I had to put side-boards on my memory early in the proceedings

Some of the engineers who pull the Limited trains have been good enough to invite me to their homes, where I had an opportunity to see

how the masters of the most fascinating of all professions live; while I listened to stories of real life more dramatic than any fiction penned by genius. Imagine a father killing his only son and his wife's hair turning white from grief in a night!

Nor have the current chapters been forgotten. The engineer who found the 43-foot grade up Echo Cañon after others had failed laid aside urgent work to tell me about it. Also he related how the Union Pacific was operated by horses—once

Some of the current chapters I have seen in the making. F'instance, I rode up Sherman Hill, the highest point on the line, on a motor-car with the roadmaster; saw the greatest living steam-shovel virtuoso render a symphony on Sherman gravel and— But wait till I tell you about it.

I have seen the busiest bit of single track in the world, and, farther along, the most remarkable section of railroad to be found on this big, round earth.

Big Railroading?

Here it is—on the Overland Trail.

My one hope is that I may be able to treat the subject in some measure worthy of its greatness.

CHARLES FREDERICK CARTER.

Sacramento, California.

WITH democracy calling for all the available men of military age to run its war trains, the steam carriers of this country began to run mighty short of good employees.

And the result?

Every man who had graduated from the operative class into prosperous middle-aged success along other lines began patriotically to volunteer for train service. Literally, "doctor, lawyer, merchant, chief," responded to this emergency call of the rail. Frank Kavanaugh, himself an old hand who gave up a good job to juggle tissues on a freight in order to free a young fellow for active service, will tell about the high-brow crews they have to-day throughout his territory in the middle West as a result of the war conditions.

HAS the subject of duplex telegraphy ever puzzled you? It needn't after next month, for then you can buy the December issue of the magazine, turn to the department, "Help for Men Who Help Themselves," and read an article by Samuel W. Beach on the duplex that will make the subject as clear as crystal.

"OLD Times on the Northern Pacific," by J. E. M., opens with this situation: "It was the dead of winter. Our itinerant friend blew into St. Paul from the South, clad in nothing heavier than seersucker clothing and a straw hat. He was assigned to Helena, Montana, a two-days' trip away, and provisioned himself for the journey by investing his last fifteen cents in a foot and a half of Bologna sausage. Then, after he had comfortably settled himself for a ride on the cushions, he was surprised by—"

If you are interested to know by what, you can find out "in our next."

BRAINS are a good buy. The General Electric has a seven-story building full of them, cased in scores of skulls, which do nothing but monkey around trying to get on to new curves that the company can cash-in on. The scientists do everything there from cutting up atoms to pounding things under a sixty-ton hydraulic press. And they're worth millions to the corporation. A fascinating article—this story of how big business has found that it pays to endow pure science—next month.

THE RAILROAD MAN'S MAIL-BAG.

PAGE 38 of the September issue contained a picture and a brief account of the quaint old engine, the Shakopee, which was a combination of locomotive and passenger-car. We're glad we printed that little piece, for it elicited this entertaining and informative letter from Mr. P. F. Sherman, formerly president and general manager of the South Dakota Central Railway Company. After all, there's no better reading in the world than reminiscences of the good old times—though as often as not they weren't so all fired good when compared to the times we live in ourselves, as is indicated in Mr. Sherman's letter. Consider, for instance, sugar at twenty-five cents a pound and kerosene oil at sixty cents a gallon, to be bought by conductors and engineers who made but sixty-five dollars a month. Even in these war times we can scarcely conceive of such disparity between salaries and the cost of living.

The article in your September number, "Locomotive Was Its Own Train," surely took me back to my barefooted boyhood days. The cut of the Shakopee was taken from a photograph, for I remember every inch of her from one end to the other.

I was a Shakopee boy, and rode on her many times, always on the front end, if I

could get there. With the other Shakopee boys, I had great pride in the "Dummy," for that was what everybody called her, and if any outside boy came to town and disputed the statement that the Dummy could run faster than anything else in the world, there was a fight on right away.

You have the statements about right. The Minnesota Valley Railroad arrived at Shakopee in the fall of 1866—40-lb. iron rails, small ties, and two engines, the Dummy and one American type of about 25 tons, and a few little cars of about 18,000 capacity

E. F. Drake was president and John F. Lincoln superintendent. I can see their names now on the timecard and rules tacked up in the depot. I thought they were about the biggest men in the world then, except possibly J. G. Butterfield, the master mechanic, the man who could order out an "engine" and go where he wanted to go.

The "shops" were located at Shakopee The town then depended principally on the shop people for a living, so when the pay-car was three months behind—as it was often—everybody was hard up. It was almost always behind about two months.

The road soon built on to Mankato, 86 miles from St. Paul, and rested there for a long time. That gave us the "Mankato Express." Then the line was built on to St. James, or, rather, St. James was built where the road stopped. Then it was called the St. Paul and Sioux City. Shortly afterward the road was built to Sioux City, Iowa, and that part—I suppose it was a different corporation—was called the Sioux City and St. Paul. A few years later, the Chicago, St. Paul, Minneapolis and Omaha came into being, and absorbed the St. Paul and Sioux City and the Sioux City and St. Paul.

Up to this time wood was used for fuel, bass-wood principally; but then we began to hear about "coal on the west end," and it was a great curiosity to see a "coal burner," and when the first one came to the Shakopee shops we went in bunches to see it.

I have had something to do with locomotives in my later days, and have examined a good many and bought a few, and the wonder is to me how a little boiler like the Dummy had could make enough steam to do anything. But, then, it must be considered that she did not have much to do, for the coach part was not as heavy as a small tender, and she only had to pull herself Sometimes they would put on a coach behind; but then the trouble began, and she would sputter and growl and spin her drivers in protest. We did it once for the Sunday-school picnic excursion, and when we backed into the siding on the road to let the passenger go by, we came near not getting out; but we all pushed, and there were plenty that were willing. And once when she got stuck in the snow in "Murphy's Cut" just "below town," some oxen were gathered up to help her out, for there was no "engine" on her side to do it, and there was only one more "engine," anyhow.

The back section was for passengers, the center for baggage, and the front for the enginemen and for the wood. The side-front door was for the enginemen to look back from and to take in the wood; also for the boy who went along, when he could get a chance, to throw wood for the ride, to slide open and look back at the other boys that he had just passed

The Dummy was used as an extra for many years after the road became the St. Paul and Sioux City, and the last that I remember she was running between Shakopee and Carver on the C., M. and St. P., or, as it was then, the "Hastings and Dakota," as a cut-over to meet trains.

Yes, sixty-five dollars a month was about right for conductors and engineers, and when they were raised to eighty-five dollars it was considered immense. And granulated sugar was four pounds for a dollar, kerosene oil sixty cents a gallon, and it was villainous stuff. They used to send the "young ones" out of the room before they lit the lamp. Other prices in proportion; and still we were as happy as now. Verily, this is a world of unrest. A few years ago I witnessed a street-parade in Minneapolis at night A bob-tailed street-car came along drawn by a mule, and on its side it said: "In 1870 we rode in this and were happy." Then came an up-to-date electric-car, and on its side was placarded: "And now we ride in this and kick."

These were before that greatest railroad man, James J. Hill, went into the railroad business—that is, the early Dummy days. Mr Hill came to Shakopee some years before his death to speak at the county fair, and he said, as the committee helped him off his car: "Now take me to the levee. I want to see the place where I used to buy hoop-poles."

The RAILROAD MAN'S MAGAZINE is all right, and fills a place. I have read every copy since the first issue; and while I am not in the railroad business now, the statement that "Once a railroad man always one" has a strong hold on me. P. F. SHERMAN.

Sherman-Bennett Company,
343 South Dearborn Street,
Chicago, Illinois

WHO FOUGHT OUR WAR?

OUR Civil War has often been called the "War of Youth" on account of the age of the soldiers upon enlistment In this connection an interesting table is given in "The American Army," Major-General William H. Carter's recent book

Of a total of 2,778,304 men enlisted in the Union army during the war, less than one-fourth were more than twenty-one years old. The table of ages at enlistment follows:

Those 10 years and younger	25
Those 11 years and under	38
Those 12 years and under	225
Those 13 years and under	300
Those 14 years and under	1,523
Those 15 years and under	104,087
Those 16 years and under	231,051
Those 17 years and under	844,891
Those 18 years and under	1,151,438
Between 18 and 22 years	2,150,798
Between 22 and 26 years	618,511
Between 26 and 45 years	46,462
More than 45 years old	16,071

The statistics relating to very young boys, General Carter says, have often been questioned, but he adds that it must be remembered that the enlistment of mere children as drummers and fifers formerly was authorized in our army. General Carter himself was only twelve and a half years old when he enlisted as a mounted despatch messenger in 1864.

ANOTHER BRAIN-TEASER.

WE are indebted to Mr. Joe Tribus, Call Box 227, Dillonvale, Ohio, for the accompanying ingenious brain-teaser Reach for the cerebral dust-rag, boys!

A station-agent was given 12 rose-plants with which to brighten up the depot plat. In order to make a more effective showing, he placed the 12 plants in 6 rows of 4 flowers each. How did he do it?

Answer next month

HOW THE SWITCHING WAS DONE.

LOTS of answers to Walter T. Tyler's switching problem, recently published. Of them all, however, the solution submitted by C. H. Skaats, an engineer on the New Haven, seemed the most comprehensive and railroady. Below we reprint the problem, and follow it with Mr Skaats's solution. By the way, if you like puzzles, be sure to turn to Sam Loyd's "Riddles for Railroaders," on pages 378 to 380 of this issue.

A is a freight-train consisting of an engine and 30 cars.

B is a passenger-train consisting of an engine and 9 cars.

C is a freight-car on siding with a drawhead on east end pulled out

DD is a siding that will hold 9 cars only.

E is main line that will hold 8 cars and engine between switches.

F is a passenger-train consisting of an engine and 10 cars.

A and B are coming west. F is going east. F has a dining-car, which is the fifth car from the engine, to be placed on B as fourth car from the engine. B has a baggage-car, which is next to the engine, to be placed on the rear end of F. C has to go on the rear end of A.

How are B and F going to exchange their cars, and A pick up C, and F pass A and B at this point? It can be done—but how?

WALTER T. TYLER.

Long Island Railroad,
Richmond Hill, Long Island.

SOLUTION TO MR. TYLER'S TEASER.

The following is my solution of "Tyler's Teaser," appearing in the August RAILROAD MAN'S MAGAZINE

Let F head in at west end of DD and couple on to C and back out. Let B stop far enough back to hold four cars between train and east end of DD, and engine and head car of B then head in on DD

Let F with C coupled on head end pull through E, stopping so that B can head out of west end of DD and put baggage-car on rear end of F and then back in again at west end of DD

Then F with C still coupled on can back up to clear west end of DD, and B can back through DD and couple to remainder of train and pull in on E and clear between switches of DD

Then F with C coupled on head end can pull through and out east end of DD. Then B can pull out to clear west end of DD, and F can back six rear cars in on DD and cut off and pull head end of train out and back the fifth head car, which is the dining-car, in on E

Then cut off and pick up rear end of train on DD, and pull out to clear east end on DD. Then B can back five cars in on DD, and then cut off and pick up dining-car that F left on E, and then couple to rear of train on DD, and then proceed on its way west.

Then F with C still coupled on to head end can back up to clear west end of DD, and leave about five cars on the main and head in at west end of DD with detached head end of train and C still coupled to head of F.

A can run through E and couple on to detached portion of F and push it ahead of it till rear end of A clears west end of DD far enough for F to back out of DD with head end of train, leaving C in on DD

Then F can pull the head end of its train through E and past the east end of DD far enough to allow A to back through DD, and couple C on to rear end of A and to leave the rear end of F on DD while backing through, and then back out to clear east end of DD.

Then A can proceed west on its way through E.

Then F can back up and pick up rear end of train on DD, and then proceed on its way east.

C. H Skaats,
Engr., N. Y., N. H. and H R. R.
14 Charter Oak Avenue,
Hartford, Connecticut

CURSES ON THE TYPE IMP!

THE Imp of the Perverse, about which Edgar Allan Poe waxed so eloquent, must hang out in a printing-office. For instance, there was a bully letter written for the September Mail-Bag by Dana W. Kerr, of Omaja Oriente, Cuba, about the effects of the recent revolution on railroad and telegraph in his neck of the woods. All went beautifully until we came to printing the name of the correspondent, and then that confounded imp made the types call him Sana W Kerr instead of Dana W. Kerr. Mr. Dana W. Kerr, we apologize on behalf of both ourself and imp.

FLASHES FROM OUR READERS.

Am an old rail myself, but, Mr. Secretary, don't you think our magazine is getting a little too technical for the average rail who is a great reader of our magazine?

J. F. Bront.

Care of W. L. Jones,
Mountain States T & T. Co.,
Denver, Colorado.

I am a post-card sharp, and am asking you to help me start a club of railroad post-card men. We will exchange cards and cards only. Some very nice collections can be made up. If you are game to start a club, please publish this in your red-headed magazine. No charges. I would suggest that every man send a card to every one else, and only men the world over connected with the rail be allowed to look in.

R. G. Summers.

317 Noxon Street,
Syracuse, New York

Do you think it would be possible for some one to invent a vacuum for unloading grain? It would not only be a big saving, but also save a lot of time. Presume there is no such invention as yet.

Fred Greenclay.

Park-American Hotel.
Kalamazoo, Michigan.

Enclosed will find post-office money order for one dollar, for which please enter my subscription to your Railroad Man's Magazine for one year.

You have just the magazine for such fellows as I who have left the service, and like to have old memories brought back. It is just as you say in a few numbers back: "The call of the brass never wears out"; and every time I pass an office I can hardly resist the call; but supporting a family on telegrapher's wages nowadays is no snap.

Here's good luck to your paper and staff of virtues.

Walter A. Leininger.

43 North Edward Street,
Kenosha, Wisconsin.

I am a constant reader of your magazine, and words fail to express my appreciation, and would suggest that any man who loves the thrills of the rail to secure at once a copy, for if he doesn't, he certainly is missing a lot of past recollections recalled by veterans. I could sit by the hour and listen to experiences told by fellows who seem to delight in broadening their imaginations.

Geo W. Lechlider.

419 Torderick Avenue,
Baltimore, Maryland.

Am a boomer and reader of your magazine for a number of years, but never ran across anything so foul as that letter by J. B. King, "Master Beggar," in your September issue. That "cat" or "dingbat" is a bit off his noodle.

J. B. King is the way a certain road paymaster in this country signed his name, and a little fellow who took it into his head that he could beat that guy writing it is in the pen now, serving time for forgery. I know just what I am talking about, for when he was sent up I was switching in the same yard, and we all used to write J. B. King on the cars when we got to talking about it, and this isn't over seventeen years ago—along about 1903—so your ten-dollars a-day J. B. King is a scisorbilt. Any old snake knows this.

Kentucky Slim.

Alliance, Ohio.

In regard to the discussion over the picture which accompanied C. H. Claudy's article, "Romance of the Coupler":

Mr. Claudy's article is O K., but did it strike Mr. I. H. Baxter and Mr. Joe Allan that the shack in the picture is coupling the engine onto the car? If you will notice, it is the tender or tank of the engine that is coming back. Notice that the drawhead on tank is bolted solid to the sill, also that the braces on back of tank are riveted to the back of the tank and then bolted to the end sill of frame.

Therefore, as all engineers are nice, careful men, and always come back easy when coupling engine onto train, it would be perfectly safe for the shack to tie the goat onto the train in any old kind of a way he wanted to, even if he wanted to stand on his head and use his feet.

Eagle Eye

LAY OF THE ANCIENT LOCOMOTIVE.

IN the June issue there appeared several lines of a poem with an appeal to readers to finish it; and in the September number were published a number of endings written by various correspondents out of their own heads. Here is the original poem complete. It was sent in by a friend with the information that it appeared in the *Technical World* magazine some fifteen years ago. The author is R. B. Manbert.

THE engineer, a mighty man, with grease upon his nose,
Was crawling underneath his trucks and soiling up his clothes
To oil his throbbing engine, with a piece of rubber hose,
When sauntered up the fireman, a goodly man and true,
And spun this yarn which I, in turn, am spinning on to you.

"'Twas many years ago," says he, a pulling out a hunk
Of Brotherhood Tobacco and biting off a chunk,
"When me and Bill, the engineer, first hiked it up the rails,
With Bill behind the throttle of a bunch of scrap and nails;
And me a feeding paper-waste and now and then a coal,
And all the while a keeping of me finger on a hole
To keep the steam from spurting through, where she had sprung a leak,
And Bill so busy likewise that he couldn't stop to speak.

"Ah me, those times are over," and he heaved a heavy sigh,
And suddenly I noticed that a tear stood in his eye;
"We used to call her 'Grandma' 'cause she looked so weak and frail,
For every time she turned a wheel, she seemed to shed a nail;
Her firebox kept coming loose, her cab was all askew,
And every switch we hit she seemed to sort of bend in two;
Sometimes she used to have a kind of fussy, fretful day,
And scattered every brand of junk along the right-of-way.
The section bosses hollered that we littered up the track,
But used to save the pieces 'cause we had to put 'em back.

"But Bill"—his eye roved up the track—"was bound to stick it through;
He telegraphed in orders for manila-rope and glue.

"One day we got despatches for to shift an empty car
That was lying on the siding—and it wasn't very far;
But Bill got out his monkey-wrench and bolted on his clamps,
While I patched up the biggest holes with canceled postage stamps;
We tied a rope around her, and we nailed her smokestack fast,
And Bill put in some mucilage and 'lowed he thought she'd last.
I heated up the water in her boiler to a boil;
We couldn't have it hotter 'cause she might blow up and spoil.

"Ah me, she was a gallant craft, that ancient iron steed"
Dejection sat upon him as though his heart would bleed.

"She traveled down the rumbling road with weird, asthmatic groans;
She limped up to the box car with her stiff, rheumatic bones.
We coupled on, Bill pulled her wide, she gave a mighty stir;
Her whistle blew, her bell rang out, she trembled to a blur;
Bill's face grew ashy pale; he cried, 'Jim, jump; she's going to bust!'
When suddenly she gently sighed, and crumbled into dust."

He stopped—the grimy engineer was crawling from his hole.
A minute more—the fireman was busy shoveling coal.--

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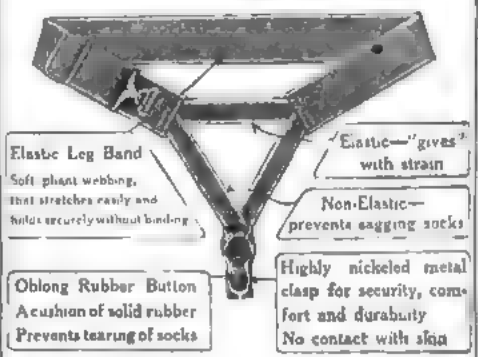
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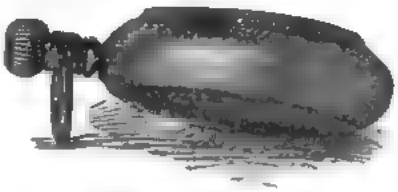
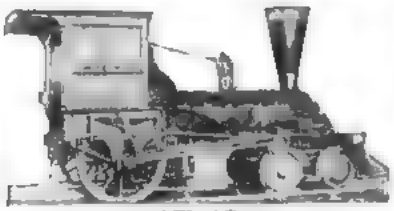


The Old 18 Size Watch



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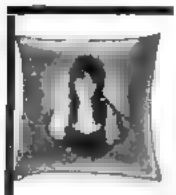

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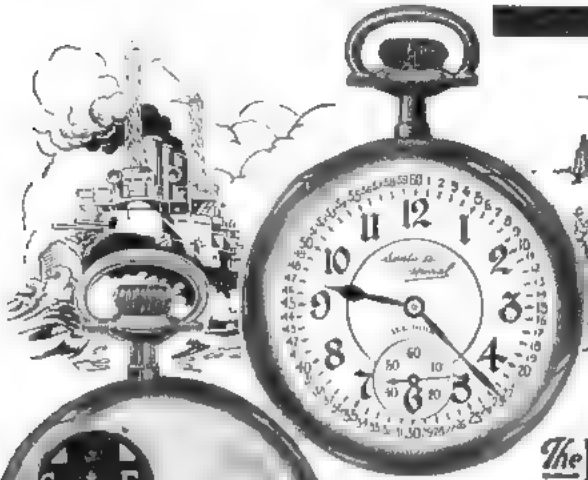

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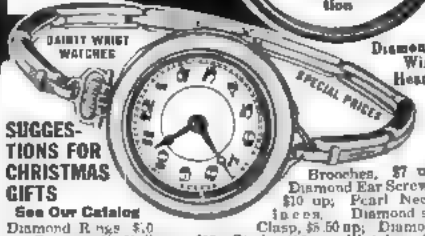

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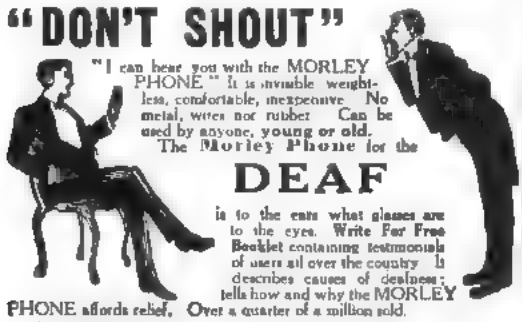

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- ☐ Steam Engineer
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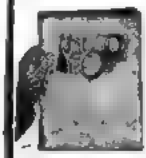

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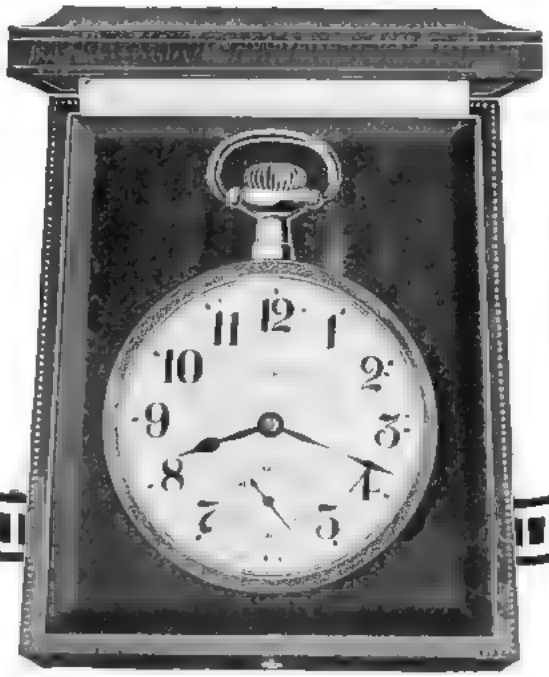

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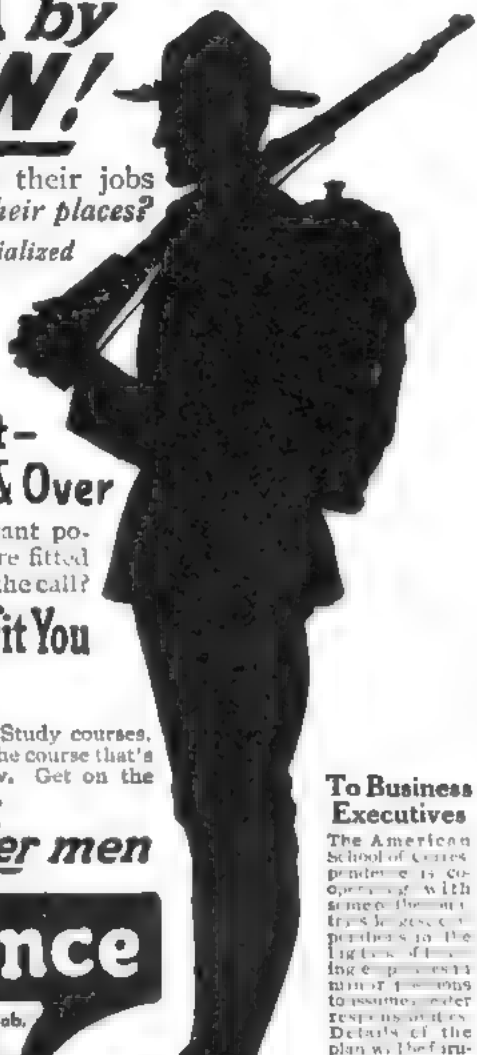

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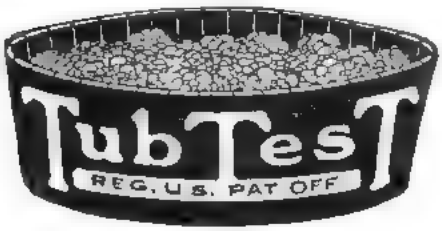

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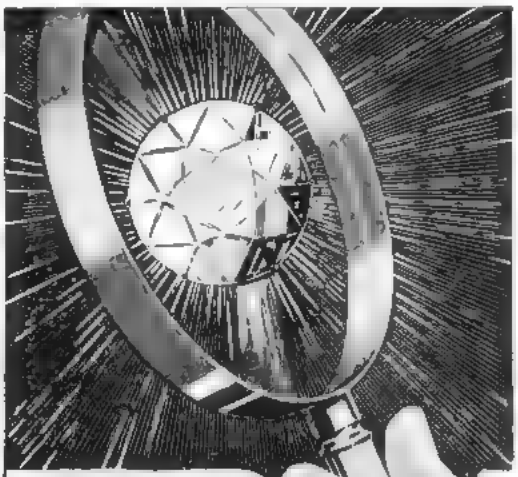

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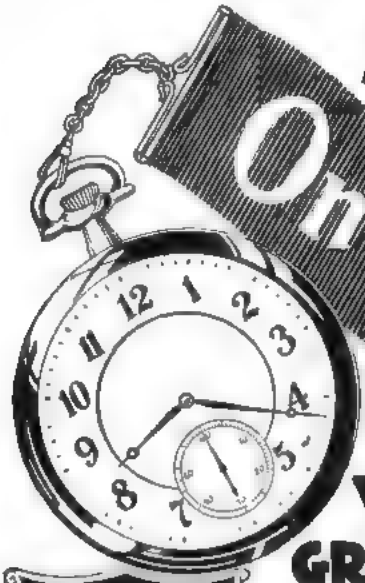

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